
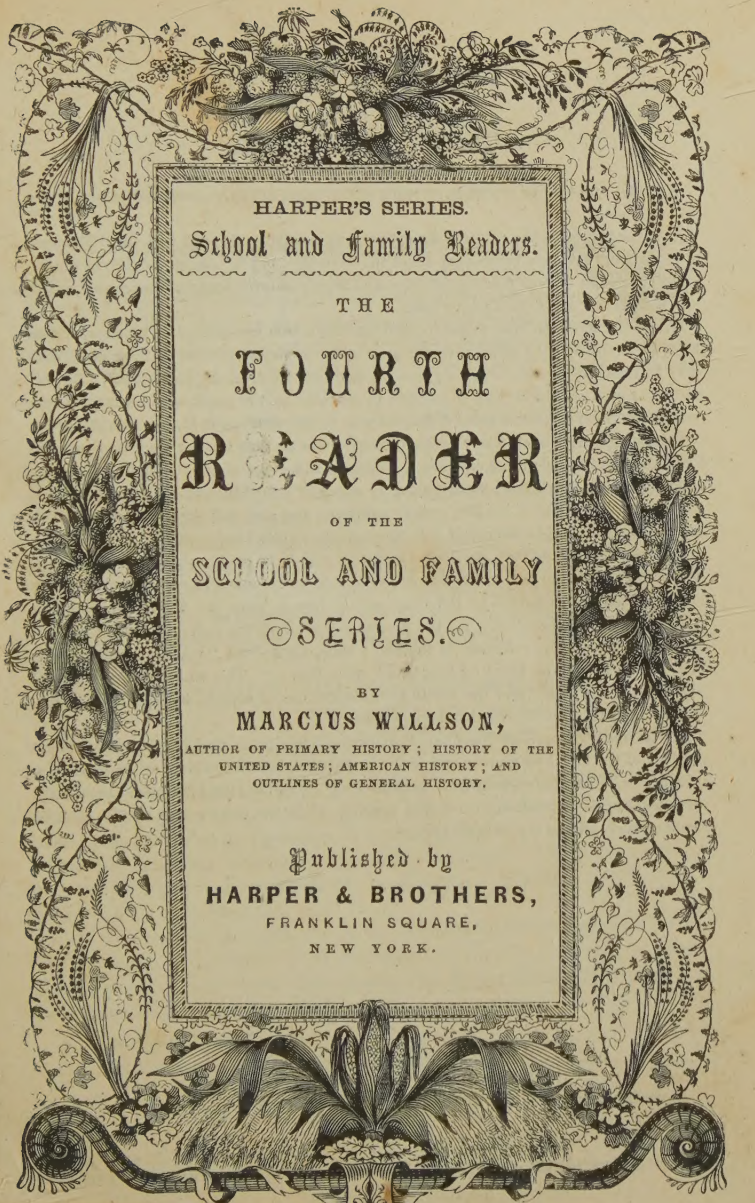


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HARPER'S SERIES.
School and Family Readers.

THE
FOURTH
READER
OF THE
SCHOOL AND FAMILY
SERIES.

BY
MARCIVS WILLSON,
AUTHOR OF PRIMARY HISTORY; HISTORY OF THE
UNITED STATES; AMERICAN HISTORY; AND
OUTLINES OF GENERAL HISTORY.

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TO THE TEACHER.

WE take occasion to repeat here some of the introductory remarks contained in the Third Reader.

I. We suggest that the reading-class should repeatedly go through with the "Elements of Elocution," not only by reading aloud the examples, but by selecting daily, at the beginning or close of each reading exercise, and from whatever sources they choose, examples illustrating *some one Rule* or Note.

II. As the more difficult words in each reading lesson are defined at its close, and *in that particular sense in which they are used in the passages referred to*, these definitions may be made to contribute greatly to a correct knowledge of the lesson read. To this end the lesson should always be studied in *advance* by the pupil, who, after reading a verse, should explain these more difficult words by *substituting* in their places either the definitions given, or such terms of his own selection as may answer the same purpose. The benefits of this defining exercise to pupils in this stage of advancement will not be inconsiderable; for, besides contributing to a better knowledge of the lessons read, it will cultivate a *habit* of reading understandingly, and also call particular attention to the meaning of nearly a thousand individual words in this Reader alone.

III. In the words defined, particular attention should be paid to their correct *accentuation*, and also to the correct *sounds of the letters*, as designated by the accompanying marks, which are explained by the Pronouncing Key on page 14. The pupil should be required to give the authority for the pronunciation of all the more difficult or uncommon words defined by reference to the Key; thus, *ARCH'-IVES*, "Italian sound of *ā*, as in *für, fäther*; *c* hard, like *k*; *i* long; and soft *s*, like *z*." This will compel a familiarity with the Key, and train the ear to nice distinctions of sounds, indispensable requisites in securing a cultivated elocutionary taste.

IV. As Part V., entitled *NATURAL PHILOSOPHY*, should be *studied* more than other portions of the book, we recommend to the teacher to require the class, when beginning this Reader, to read *one* lesson each week in Part V., and to study the lesson previously with considerable attention. A second reading, when the class comes to this Part in regular order, will be a profitable review.

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P R E F A C E.

IN this FOURTH READER, the leading *plan* of the "School and Family Readers," which is that of combining useful knowledge with instruction in reading, is more fully developed than in the Third Reader; and from the manner in which some of the departments of Natural Science are here treated, teachers may judge whether the plan is feasible or not, and how it will be likely to succeed when extended to the subjects embraced in the remaining three numbers of the series.

Teachers will observe that, while we have aimed to make the several divisions, or "Parts," in this Reader as *instructive* as possible, we have not lost sight of the importance of making them *interesting* also; and to this end we have introduced great *variety* in matter and manner, and illustrations which are valuable lessons in themselves.

For the sake of that regular *gradation* which is highly essential in School Readers, and to avoid introducing too much on any one subject in the same book, we have made two divisions each of Human Physiology, Botany, and Natural Philosophy, and have given only the first and easier portion of each subject in the present Reader. The second divisions will be contained in the Fifth Reader.

Zoology is here continued in the division entitled *Ornithology*, or Birds. For the beautiful illustrations in this part we are indebted to the same artist (Parsons) to whom we expressed our obligations for the admirable drawings of animals in the Third Reader.

In Part IV., "Miscellaneous," we have given a few *old* standard pieces, because they are unsurpassed in merit, will be *new* to every succeeding generation, and have no superiors as reading exercises.

Part VI., entitled "Sketches from Sacred History," partially develops the plan which will be pursued in the *Historical* divisions of the Fifth, Sixth, and Seventh Readers.

I am indebted for valuable aid in the departments of Botany and Natural Philosophy to Professor N. B. Webster, of Virginia, by whom portions of those divisions and some original and very happy illustrations of philosophical principles were furnished.

M. WILLSON.

NEW YORK, May 1st, 1860.

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ELEMENTS OF ELOCUTION.

RULE I.—Direct questions, or those that can be answered by yes or no, generally require the rising inflection, and their answers the falling.

EXAMPLES.—Do you think he will come to-day? No; I think he will not.—Was that Henry? No; it was John.—Did you see William? Yes, I did.—Are you going to town to-day? No, I shall go to-morrow.

MODIFICATIONS OF RULE I.

NOTE I.—Answers that are given in a careless or indifferent manner, or in a tone of slight disrespect, take the rising inflection in all cases.

EXAMPLES.—Did you see William? I did.—What did he say to you? Not much. See, also, Lesson II., p. 39, of Second Reader.

NOTE II.—Direct questions, when they have the nature of an appeal, or are spoken in an exclamatory manner, take the *falling* inflection. In these cases the voice often falls *below* the general pitch, contrary to the general rule for the falling inflection.

EXAMPLES.—Is not that a beautiful sight?—Will you persist in doing it?—Is it right?—Is it just?

Was ever woman in this humor wooed?
Was ever woman in this humor won?

NOTE III.—When a direct question is not understood, and is *repeated* with emphasis, the repeated question takes the falling inflection.

EXAMPLES.—Will you speak to him to-day? If the question is not understood, it is repeated with the falling inflection, thus: Will you speak to him to-day?—Are you going to Salem? I said, Are you going to Salem?

RULE II.—The pause of *suspension*, denoting that the sense is unfinished, such as a succession of particulars that are *not emphatic*, cases of direct address, sentences implying condition, the case absolute, etc., generally requires the rising inflection.

EXAMPLES.—John, James, and William, come here.—The great, the good, the honored, the noble, the wealthy, alike pass away.

Friends, Romans, countrymen, lend me your ears.

Jesus saith unto him, Simon, son of Jonas, lovest thou me?

Ye hills', and dales', ye rivers', woods', and plains',
 And ye that live and move, fair creatures', tell',
 Tell, if ye saw, how came I thus'; how here'?

NOTE.—For cases in which *emphatic* succession of particulars modifies this rule, see Rule VIII.

RULE III.—Indirect questions, or those which can not be answered by *yes*, or *no*, generally require the falling inflection, and their answers the same.

EXAMPLES.—When did you see him'? Yesterday'.—When will he come again'? To-morrow'.

Who say the people that I am'? They answering, said, John the Baptist'; but some say Elias'; and others say that one of the old prophets' is risen again.

NOTE.—But when the indirect question is one asking a *repetition* of what was not at first understood, it takes the *rising* inflection. “What did he say'?” is an indirect question, with the falling inflection, asking for information. But if I myself *heard* the person speak, and did not fully understand him, and then ask some person to *repeat* what he said, I give my question the *rising* inflection, thus, “*What'* did he say'?” (Remark.—Perhaps the true reason of the rising inflection here on the word *say* is because it is preceded by an emphatic word (what) with the falling inflection. See note to Rule IV.)

RULE IV.—A completion of the sense, whether at the close or any other part of the sentence, requires the falling inflection.

EXAMPLES.—He that saw me' saw you also', and he who aided me once' will aid me again'.

In the beginning, God created the heavens and the earth'. And the earth was without form, and void'; and darkness was on the face of the deep': and the spirit of God moved upon the face of the waters'.

NOTE.—But when strong emphasis, with the falling inflection, comes near the close of a sentence, the voice often takes the rising inflection at the close.

EXAMPLES.—If William does not come, I think *John'* will be here'.—If he *should* come, *what'* would you do'?

CASSIUS. What night is this?

CASCA. A very pleasing night to *honest'* men'.

Proceed', I am attentive'.

This is the course rather of our enemies, than of *friends'* of our country's liberty'.

If the witness does not believe in God, or a future state, you can not *swear'* him'.

RULE V.—Words and clauses connected by the disjunctive *or*, generally require the rising inflection before the disjunctive, and the falling after it. Where several words are thus

connected *in the same clause*, the rising inflection is given to all except the last. †

EXAMPLES.—Will you go' or stay'? I will go'.—Will you go in the buggy', or the carriage', or the cars', or the coach'? I will go in the cars'.

He may study law', or medicine', or divinity'; or, he may enter into trade'.

The baptism of John, was it from heaven', or of men'?

Did he travel for health', or for pleasure'?

Did he resemble his father', or his mother'?

NOTE I.—When the disjunctive *or* is made emphatic, with the falling inflection, it is followed by the rising inflection, in accordance with the note to Rule IV.; as, “He *must* have traveled for health, or' pleasure'.”

EXAMPLES.—He must either *work*', or' study'.—He must be a *mechanic*, or' a lawyer'.—He must get his living in *one* way, or' the other'.

NOTE II.—When *or* is used *conjunctively*, as no contrast is denoted by it, it requires the *rising* inflection *after* as well as before it, except when the clause or sentence expresses a *completion* of the sense.

EXAMPLES.—Did he give you money', or food', or clothing'? No', he gave me nothing'.

RULE VI.—When *negation* is opposed to *affirmation*, the former takes the rising and the latter the falling inflection, in whatever order they occur. Comparison and contrast (*antithesis*) come under the same head.

EXAMPLES.—I did not *hear* him', I *saw* him'.—I said he was a good soldier', not' a good citizen'.—He will not come to-day', but to-morrow'.—He did not call me', but you'.—He means dutiful', not undutiful'.—I come to *bury* Caesar', not to *praise* him'.

This is no time for a tribunal of justice', but for showing mercy'; not for accusation', but for philanthropy'; not for trial', but for pardon'; not for sentence and execution', but for compassion and kindness'.

Comparison and Contrast.—Homer was the greater genius', Virgil the better artist'; in the one we most admire the man', in the other the work'.—There were tyrants at home', and robbers abroad'.

By honor' and dishonor'; by evil report' and good report'; as deceivers', and yet true'; as unknown', and yet well known'; as dying', and behold we live'; as chastened', and not killed'; as sorrowful', yet always rejoicing'; as poor', yet making many rich'; as having nothing', yet possessing all things'.

When our vices leave *us*', we flatter ourselves *we* leave *them*'.

The prodigal robs his *heir*', the miser robs *himself*'.

NOTE I.—Negative sentences which imply a continuance of thought, although they may not be opposed to affirmation, frequently close with the rising inflection; as,

True politeness is not a mere compliance with arbitrary *custom*'.

Do not suppose that I would *deceive* you'.

These things do not make your *government*'.

This is nearly allied in character to Rule IX.; and such examples as those under Note I. may be considered as expressive of *tender* emotion, in opposition to *strong* emotion. Affirmative sentences similar to the fore-

going require the rising inflection, in accordance with Rule IX., when they express *tender* emotion; as,

I trust you will *hear me*'. I am sure you are mistaken'.

But, sir, the poor must not starve'; they must be taken care of'.

NOTE II. — When, in contrasted sentences, negation is attended with deep and calm feeling, it requires the falling inflection.

EXAMPLE. — We are perplexed', but not in despair'; persecuted', but not forsaken'.

RULE VII. — For the sake of variety and harmony, the last pause but one in a sentence is usually preceded by the rising inflection.

EXAMPLES. — The minor longs to be of age'; then to be a man of business'; then to arrive at honors'; then to retire'.

Time taxes our health', our limbs', our faculties', our strength', and our features'.

NOTE. — The foregoing rule is sometimes departed from in the case of an emphatic succession of particulars, for which, see Rule VIII.

In the second example above, the rising inflection is given to the words *health, limbs*, etc., both because they are *not* attended with strong emphasis, and because they *are* followed by the pause of suspension.

RULE VIII. — 1st. *A Commencing Series.*

In an *emphatic series of particulars*, where the series begins the sentence, but does not either end it or form complete sense, every particular *except the last* should have the falling inflection.

EXAMPLE. — Our disordered hearts', our guilty passions', our violent prejudices', and misplaced desires', are the instruments of the trouble which we endure.

2d. *A Concluding Series.*

When the series ends the sentence, or forms complete sense, every particular in the series, *except the last but one*, should have the falling inflection; and, indeed, *all* should have it, if the closing member of the series is of sufficient length to admit a pause with the rising inflection, before the end.

EXAMPLE. — Charity suffereth long', and is kind'; charity *envieth not*', charity *vaunteth not itself*'; is not puffed up'; doth not behave itself *unseemly*'; seeketh not her own'; is not easily provoked'; thinketh no evil'.

NOTE. — The degree of emphasis, and often of solemnity, with which the successive particulars are mentioned, decides, in cases of the pause of suspension (see Rule II.), whether the rising or the falling inflection is to be used. Thus, a succession of particulars which one reader deems *unimportant*, will be read by him throughout with the rising inflection, while another, feeling more deeply, will use the falling inflection. Thus:

1. The birds sing', the lambs play', the grass grows', the trees are green', and all nature is beautiful'.

2. The blind see'; the lame walk'; the lepers are cleansed'; the deaf hear'; the dead are raised'; and to the poor' the gospel is preached'.

In this example *all* the particulars have the falling inflection.

The first line in Mark Antony's harangue is read differently by equally good readers; but the difference arises wholly from their different appreciation of the spirit and intention of the speaker. Thus:

Friends', Romans', countrymen', lend me your ears'!

Friends', Romans', *countrymen'*, lend me your ears'!

If Antony designed to characterize "countrymen" with peculiar emphasis, he gave it the *falling* inflection, otherwise he gave the word no greater prominence than the preceding words "friends" and "Romans."

RULE IX.—Expressions of *tender* emotion, such as grief, pity, kindness, gentle joy, a gentle reproof, gentle appeal, gentle entreaty or expostulation, etc., commonly require a gentle *rising* inflection.

EXAMPLES.—Mary'! Mary'! do' not do so'.

My mother'! When I learned that thou wast dead',

Say'st thou conscious' of the tears' I shed'?

Hov'ered thy spirit o'er thy sorrowing son',

Wretch even then', life's journey just begun'?

I would not live away'; I ask not to stay,

Where storm after storm rises dark o'er the way';

I would not live away, thus fettered by sin';

Temptation without, and corruption within';—

Is your *father'* well', the *old man'* of whom ye spake'? Is *he'* yet alive'?

RULE X.—Expressions of *strong* emotion, such as the language of exclamation (not designed as a question), authority, surprise, distress, denunciation, lamentation, earnest entreaty, command, reproach, terror, anger, hatred, envy, revenge, etc., and strong affirmation, require the *falling* inflection.

EXAMPLES.—What a piece of work is man'! How noble in reason'! how infinite in faculties'! in action', how like an angel'! in apprehension', how like a God'!

My lords, I am *amazed'*; yes, my lords, I am *amazed'* at his Grace's speech.

Woe unto you Pharisees'! Woe unto you Scribes'!

You blocks', you stones', you worse than senseless things'!

Go to the ant', thou sluggard'; consider her ways, and be wise'.

Jesus saith unto her, Mary'. She turned herself, and said unto him, *Rabboni'*.

I tell you, though *you'*, though all the *world'*, though an angel from *heaven'* should declare the truth of it, I could not believe it.

I *dare'* accusation. I *defy'* the honorable gentleman.

I'd rather be a *dog'*, and bay the *moon'*, than such a Roman'.

CAS. O ye gods! ye gods! must I endure all this'?

BRU. All this? ay', and more'.

NOTE.—When exclamatory sentences become questions they require the rising inflection.

EXAMPLES.—*What* are you saying'!—*Where* are you going'!

They planted by *your* care! No'! your oppressions planted them in America'.

THE CIRCUMFLEX OR WAVE.

RULE XI.—Hypothetical expressions, sarcasm, and irony, and sentences *implying* a comparison or contrast that is not fully expressed, often require a union of the two inflections on the same syllable.

EXPLANATION.—In addition to the rising and falling inflections, there is what is called the *circumflex* or *wave*, which is a union of the two on the same syllable. It is a significant twisting or waving of the voice, generally first downward and then upward, but sometimes the reverse, and is attended with a sensible *protraction* of sound on the syllable thus inflected. It is marked thus: (~) as, “I may possibly go to-morrow, though I can not go to-day.” “I did it myself, sir. Surprising'! *Yôu* did it!”

EXAMPLES.—If the *righteous* scarcely be saved, where shall the ungodly and the sinner appear?

I grant you I was *dôwn*, and out of breath; and so was he.

And but for these vile *gûns*, he would himself' have been a soldier'.

QUEEN. Hamlet', you have your father much offended.

HAMLET. Madam', *yôu* have my father much offended.

SHYLOCK. If it will feed nothing else, it will feed my *revênge*.

Hath a *dôg* money? Is it possible a *cûr* can lend two thousand ducats'?

They tell *ûs* to be moderate; but *thêy*, *thêy* are to revel in profusion.

Yôu pretend to reason'? You don't so much as know the first elements of reasoning.

NOTE.—A nice distinction in sense sometimes depends upon the right use of the inflections.

EXAMPLES.—“I did not give a sixpence'.”

“I did not give a sixpence'.”

The circumflex on *sixpence* implies that I gave more or less than that sum; but the falling inflection on the same word implies that I gave nothing at all.

“Hume said he would go twenty miles to hear Whitefield preach,” (here the circumflex implies the contrast), “but he would take no pains to hear an *ôrdinary* preacher.”

“A man who is in the daily use of ardent spirits, if he does not become a *drûnkard*', is in danger of losing his health and character.”


The rising inflection on the closing syllable of *drunkard* would pervert the meaning wholly, and assert that, in order to preserve health and character, one must become a drunkard.

“The dog would have died if they had not cut off his head.”

The falling inflection on *died* would make the cutting off his head necessary to saving his life.

A physician says of a patient, "He is *bétter*." This implies a positive amendment. But if he says, "He is *bétter*," it denotes only a partial and perhaps doubtful amendment, and implies, "But he is still dangerously sick."

THE MONOTONE.

RULE XII.—The *monotone*, which is a succession of words on the same key or pitch, and is not properly an inflection, is often employed in passages of solemn denunciation, sublime description, or expressing deep reverence and awe. It is marked with the short horizontal dash over the accented vowel.  It must not be mistaken for the *long sound* of the vowels, as given in the Pronouncing Key.

EXAMPLES.—And one cried unto another, and said, Hôly, hôly, hôly is the Lôrd of hôsts. The wôhle eârth is full of his glôry.

Blëssing, hônor, glôry, and pôwer be ûnto hîm that sitteth on the thrône, and to the Lâmb forêver and evêr.

In thôughts from the visions of the nîght, when dêep slêêp fâlleth on mên, fêar câme upôn me, and trêmbling which mâde all my bônes to shâke. Thên a spîrit pâssed befôre my fâce; the hâir of my fîesh stôod ûp. It stôod still, but I côuld not discôrn the fôrm thereûf: an Image was befôre my efes, there was silence, and I heard a vóice, sâying, Shâll môrta! xân be môre júst than Gôd? Shâll a mân be môre pûre than his Mâker?

EMPHASIS.

Emphasis is a forcible stress of voice upon some word or words in a sentence on account of their significancy and importance. Sometimes it merely gives *prolonged loudness* to a word, but generally the various inflections are connected with it. Thus it not only gives additional *force* to language, but the sense often depends upon it.

EXAMPLES.—I did not say he struck *me*; I said he struck *John*.

I did not say he *struck* me; I said he *pushed* me.

I did not say *he* struck me; I said *John* did.

I did not *say* he struck me; but I *wrote* it.

I did not say he struck me; but *John* said he did.

He that can not *bear* a jest, should never *make* one.

It is not so easy to *hide* one's faults as to *mend* them.

CASSIUS. I may do that I shall be sorry for.

BRUTUS. You *have* done that you *should* be sorry for.

(The varied effects of *emphatic stress*, and *emphatic inflection*, are so fully shown in the Reading Lessons of all the Readers, as to need no further illustration.)

KEY

TO THE SOUNDS OF THE LETTERS, AS DESIGNATED IN THE SCHOOL AND FAMILY READERS.

The system of pronunciation here adopted is that of Noah Webster, as contained in the later and improved editions of his Dictionary; and the indicative marks used are *the same* as those found in Webster's late "Pronouncing and Defining Dictionary," edited by Prof. Goodrich.

- Ā*, long, as in fāme, āim, dāy, brēak, cāke, māke; heard also in sail, veil, gauge, inveigh.
Ā, short, as in fūt, ūt, cūrry, tūriff; heard also in plāid, bāde, rūllery, etc.
Ā, *Italian*, as in fār, fāther, bālm, pāth; heard also in heārt, heārth, āunt, hāunch.
Â, as in cāre, āir, shāre, pāir, beār, fāir, pārent; heard also in where, heir.
Ä, as in lāst, āsk, grāss, dānce, brānch, stāff, grāft, pāss, chānce, chānt.
A, sound of broad *a*, as in all, call, talk, haul, swarm, awe; heard also in naught, taught.
A, short sound of broad *a*, as in what, wash. This coincides with the *o* in *not*.
Ē, long, as in mē, mēte, schēme; heard also in bēard, fīld, lēisure, brīef, sēize, kēy.
Ē, short, as in mūt, mērry; heard also in fēather, hēifer, lēopard, any, frīend, guēss.
Ê, like *ê* in cāre; as in thēre, thēir, hēir, whēre, ēre, ê'er, whenê'er, etc.
Ê, short *e* before *r*, as in tērm, vērge, vērdure, prefēr, éarth.
Ë, like long *ē*, as in ique, machine, mien, marine. This is the sound of the French *i*.
Î, long, as in pine, fine, isle; heard also in height, aisle, oblige, microscope.
Ï, short, as in pin, fin, pit; heard also in sieve, since, been (bin), etc.
İ, short, verging toward *u*, as in bird, firm, virgin, dirt.
Ō, long, as in nōte, ōh, nō, dōme; heard also in cōurse, yeōman, rōll, pōrt, dōor, etc.
Ō, short, as in nūt, bōnd; heard also in cōral, Cōrinth. It coincides with the *a* in *what*.
Ó, like short *u*, as in dōve, lōve, sōn, dōne, wōrm; heard also in dōes (duz), nōne (nun).
Ö, like long *oo*, as in prōve, dō, mōve, tōmb, löse, whō, tō.
Q, like short *oo*, as in wōlf, Wōlsey. This sound coincides with that of *u* in bull.
Q (short *oo*), as in fōt, bōk, wōp, wōd.
Ū, long, as in mūte, dūty, cūbe, ūnite, has the sound of *yū*, slightly approaching *yoo* when it begins a syllable; but in other cases it is difficult to distinguish the sound of the *y*.
Ū, short, as in būt, tūb, sūn; heard also in dūes (duz), blood (blud), etc.
Ū, long, nearly approaching *oo* when preceded by *r*, as rūle, rūde, rūby.
Ū, like *oo* (short *oo*), as in fūll, būll, pūll, pūsh, pūt (not pūt).
E (italic) marks a letter as silent, as fallen, token.

CONSONANTS.

- C* *c* soft (unmarked), like *s* sharp, as in cede, mercy.
€ *e* hard, like *k*, as in éall, éarry.
CH *ch* (unmarked), like *tsh*, as in child, choose.
CH *ch* soft, like *sh*, as in machine, chaise.
€H *ch* hard, like *k*, as in chorus, epoch.
G *g* hard (unmarked), as in go, gallant.
€ *g* soft, like *j*, as in gentle, aged.
S *s* sharp (unmarked), as in same, gas.
€ *s* soft, like *z*, as in has, amuse.
TH *th* sharp (unmarked), as in thing, path.
TH *th* flat or vocal, as in thine, their.
N€ like *ng*, as in lon^gger, con^ggress.
PH like *f* (unmarked), as in phaeton, sylph.
QŪ like *kw* (unmarked), as in queen, inquiry.
WH like *hw* (unmarked), as in when, while.

FOURTH READER.

PART I.

FIRST DIVISION OF HUMAN PHYSIOLOGY AND HEALTH.*

(This subject is continued in the Fifth Reader.)



LESSON I.

THE FRAME-WORK OF THE HUMAN BODY.

1. ALL persons know how important it is that the frame-work of a house, such as the walls, the posts, the beams, the braces, and the rafters, should be made of strong materials, and be well put together. If there should be any thing wrong

* GENERAL PHYSIOLOGY is the science which treats of the properties and functions of all *living* things, which include animals and plants.

HUMAN PHYSIOLOGY treats of the functions or offices of all the different parts or organs in the human body, and the laws which govern them; such as the action of the muscles, the circulation of the blood, digestion, breathing, etc. A knowledge of these functions requires some knowledge of the structure or *anatomy* of the parts, and the whole is the basis of that department of medicine which treats of the preservation of HEALTH.

in the frame-work, or if the materials should be poor, of what use would the building be after it should be completed?

2. The human body has a frame-work which sustains *the house we live in*. This house of ours, unlike the houses of men's making, is designed to be moved from place to place, and to be put in many different positions. It must be a strong and curiously planned frame-work that can support such a house without being broken or injured by the many movements required of it.

3. And yet if this house of ours be properly taken care of, the frame-work will support it and carry it about a great many years; and, what is still more curious, if any of the parts of the house, such as a door, a hinge, or a post, its inner apartments or its outer covering, get a little worn or injured by use, each has the power, with a little aid from the other parts, of repairing itself.

4. The *bones* of the body constitute the movable frame-work of which we have spoken. There are a great many of these bones—not less than two hundred and eight in number, besides the teeth—and they are joined together very curiously, and kept in their places by a great variety of braces, and bands, and cords, and pulleys, that hold the frame-work firmly, while they allow it to move freely in almost every direction.

5. This curious frame-work is sometimes called the *skeleton*. Nothing ever made by man can compare with it in beauty and excellence of workmanship. At the upper part of this framework is the *skull*, which is composed of eight bony plates closely interlocked¹ on their edges. The upper part of the skull, which is the crown or top of the head, gives support to the scalp or skin of the head, and the hair, and protects from injury the *brain*, which lies beneath it.

6. The brain is the seat of thought. It is there that we think, and will, and reason; that we reflect upon the past, and make plans for the future. The brain is a very delicate organ; and, as it requires the very greatest care and protection, it is lodged in the hollow of the skull, which is the strongest and safest room in the house we live in. This lodging-place has been very appropriately called "*the chamber of the soul*."

7. On the front side of this chamber are two openings, which have been called "the *windows* of the soul." They are placed with great care in little hollows called sockets, so as to be as little exposed as possible to danger from blows that might chance to fall against that side of the chamber; and, by a little roof that projects over them, they are screened² from the dust, the wind, and the rain. These windows are the most curious and most wonderful pieces of workmanship that can be conceived, but we have not time to describe them here.

8. But besides the bones of the skull, there are no less than fourteen bones of the face, and four small bones of the ear, and all together make up the frame-work of the *head*, which rests upon still another set of bones, called the spine, backbone, or *spinal column*. This is a very important part of the frame-work of the house we live in, and we shall hereafter see that it is very apt to get out of repair by bad usage.

9. This spinal column, which is the chief support of the body, is composed of no less than twenty-four bones placed one upon another, and so closely interlocked and bound together that it is almost impossible to separate them. Yet this column is very pliable and elastic, for it can be bent in all directions without injury; and between the bones are little cushions, formed of what is called *cartilage*,³ which yield to pressure like India-rubber, and spring back to their natural position when the pressure is removed.

10. Branching forward, and obliquely⁴ downward from the sides of this spinal column, are the ribs, twelve on each side, most of them fastened to the breast-bone in front. They give protection to the liver, lungs, heart, and large blood-vessels. Then there are the bones of the hands and the arms, the latter supported at the shoulder by the collar-bone, the bones of the pelvis at the lower part of the body, and the bones of the legs and feet; and thus we have the frame-work of the body completed.

11. The manner in which all the pieces of this frame-work are joined together, and the means by which they are made to move easily in various directions, are exceedingly curious. Thus the shoulder has one kind of joint, and the elbow an-

other, while the joints of the wrist and fingers are different still, each adapted to the motions which it is required to perform. They are also firmly held together by strong bands or ligaments,⁵ and the ends of the bones are very hard and smooth, and kept constantly oiled that they may not rub harshly upon each other. All these things show very clearly the wisdom and skill of Him who planned the frame-work of the house we live in.

“This curious frame betrays⁶ the power divine,
With God's own image stamped on every line.”

¹ IN-TER-LÖCKED', clasping each other.

² SCREENED', protected or sheltered from injury.

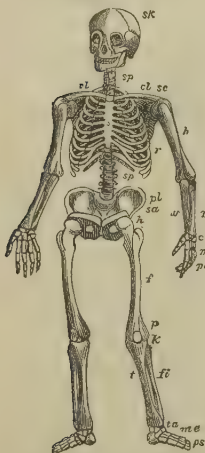
³ CÄR-TI-LÄGE, gristle.

⁴ OB-LIQUE'-LY, not in a right line; not perpendicularly.

⁵ LİG'-A-MENT, that which ties one thing to another. The ligaments are softer than the cartilages.

⁶ BE-TRÄYS', shows; exhibits.

Fig. 1.
THE HUMAN SKELETON.



sk. The skull, or *crä'-ni-um*.

sp. The spine, or spinal column, composed of 24 bones. Each piece is called a *vert'-e-bra*.

cl. The collar-bone, or *clav'-i-cle*.

sc. The shoulder-blade, or *scap'-u-la*. It is a flat, thin, triangular bone, situated on the upper and back part of the chest. It can not be seen from the front.

s. The breast-bone, or *ster'-num*.

r. Ribs, branching out from the spinal column.

h. Upper bone of the arm, or *hu'-mer-us*.

ra. Outer bone of the fore-arm, or *ra'-di-us*.

u. Inner bone of the fore-arm, or *ul'-nä*.

c. The wrist, composed of eight bones, called the *car'-pus*.

m. The palm of the hand, composed of five bones, called the *met-a-car'-pus*.

ph. The finger-bones, or *pha-lan'-ges*.

pl. Pelvis bones, called the *in-nom-i-nä'-ta*.

sa. The *sa'-crum*. It connects with the lower vertebra, and is bound by ligaments to the innominate.

h. The hip-joint.

f. Thigh-bone, or *fe'-mur*.

p. Knee-pan, or *pa-tel'-la*.

k. Knee-joint.

t. Shin-bone, or *ti'b'-i-a*.

fi. Small bone of the leg, or *fib'-u-la*.

ta. Instep, or *tar'-sus*.

me. Bones of the middle of the foot, or *met-a-tar'-sus*.

ps. Bones of the toes, or *pha-lan'-ges*.

The **SKULL**, a very important part of the human body, as it incloses and protects the *brain*, is composed of eight bones, whose ragged edges, called *süt'-üres*, interlock with each other. Each of these bones is formed of two plates of bony matter united by a spongy portion of bone. This formation interrupts, in a measure, the vibrations produced by external blows or falls, and prevents fractures from extending as far as they otherwise would in one continued bone.

The bones of the upper and lower limbs are enlarged at each extremity, as seen in the drawing, thus affording additional room, where most needed, for the attachment of the muscular tendons and ligaments which connect one bone with another.

LESSON II.

THE BONES, AND THE INJURIES TO WHICH THEY
ARE LIABLE.

1. THE bones are composed of both animal and earthy materials. The animal part gives them life, and the earthy part gives them strength; and both kinds of material are supplied by the blood. If, then, there be but little blood in the system, or if it move slowly and feebly, it will not supply a sufficient quantity of this building material.

2. In infancy the bones, being then composed mostly of animal matter, are soft and yielding; but as the child advances in years they become gradually firmer, stronger, and harder, and in very old age they sometimes become so brittle as to be easily broken. So readily do the bones in early life yield to pressure, that they are often permanently bent out of shape by careless or ignorant management; and deformity,¹ poor health, and sometimes early death, are the unfortunate results.

3. The spinal column, in its natural position, curves backward and forward, but not from side to side. This arrangement of the bones, when connected with the cushion-like cartilages between them, gives to the body great ease and elasticity² of movement, and prevents many injuries to which it would otherwise be exposed.

4. The *natural* position of the body is always the correct one; and when by accident or design the body is allowed to grow differently, one of God's laws is violated, and we are sure to be punished for it. In the growth of our bodies we may *aid* nature, but we can not with safety act in opposition to it. We may cultivate the habit of sitting and walking in an erect position, and thereby *aid* nature in providing for the proper growth of the spinal column.

5. But children often sit at their desks in the school-room, or stand during recitation, in a stooping position, or one that allows the body to curve sidewise. The bones gradually harden or *grow* in this position, until at length a confirmed stoop or a curvature³ of the spine is produced, and the body

loses that erect posture which is essential not only to manly beauty, but to health also. By this carelessness an important law of nature is violated, and deformity and suffering are the penalty paid for it. (See Figs. 2 and 3).

6. Many of the Chinese, thinking that a very small foot is a great beauty, bandage the feet of their female children so as to prevent the growth of the bones. The feet then, after a great amount of suffering, become mere awkward stumps, scarcely able to support the body, and almost wholly incapable of being used in walking. Some of the North American Indians flatten the foreheads of their children by pressure, because they think a very flat forehead is a mark of beauty; and some mothers, even among civilized and Christian people, have the equally bad taste and cruelty to compress⁴ and distort the bodies of their daughters, by cords and bandages, to make their waists smaller than their Maker designed them. The results of this cruel and wicked practice, when long persevered in, are weak, miserable, deformed bodies, and, frequently, wasting consumption⁵ and early death.

7. The bones are found to increase in size and strength, the same as other parts of the body, by a proper amount of exercise; while they become weak by inaction, and finally dwindle away. Thus the bones of the laboring man are hard and strong, while the bones of those who neglect exercise are loose in texture, weak, and deficient in size. The cause of these results is, that exercise makes the blood flow more

Fig. 2.



Fig. 3.



A person who sits facing an ascending *desk* should sit in an erect position, as in Fig. 3, and not allow the body to curve sidewise, as in Fig. 2. For the purposes of *writing*, however, a level *table*, and right side to the table, with an erect position, and paper square with the table, are perhaps preferable; although many writing masters still adhere to the old rule, "left side to the desk," which necessitates a leaning posture, and imposes a continual strain upon the muscles which support the back.

briskly, and deposits in the bony structure an increased quantity of such materials as bone is made of.

8. But, on the other hand, if a child be put to severe, continued labor, the bones will fill up and harden too rapidly before they attain their natural growth, and the child will be dwarfed in stature. If exercise be taken with moderation, it will conduce⁶ to the growth and strength of the whole body; but if it be too violent, and be too long continued without the intervals of rest which nature requires, it will be productive of evil. Here, as elsewhere, the true rule is, "Excess in nothing; moderation in all things."

¹ DE-FÖRM'-I-TY, crookedness; distortion.

² E-LAS-TIC'-I-TY, a *springy* or elastic condition of the body.

³ CŪRV'-A-TŪRE, bending.

⁴ CŌM-PRESS', to press together; to make smaller.

⁵ CŌN-SŪMP'-TION, a disease of the lungs attended with wasting of the flesh.

⁶ CŌN-DŪCE', promote; contribute; lead to.

LESSON III.

ORGANS THAT MOVE THE BODY.—THE MUSCLES.

1. WHILE the bones give support and general form to the body, the instruments by which it is moved are the *muscles*. They are what in animals is known as flesh, or lean meat, as distinguished from fat, bone, sinew,¹ or cartilage. The muscles are made of bundles of very fine threads, called muscular *fibres*, placed side by side, and bound up in a thin skin-like covering or sheath. All these threads are elastic, so that when they are stretched out they incline to shrink back again, like India-rubber. At the ends of the muscles these threads are changed into strong *tendons* or cords, which are firmly fastened to the bones.

2. The muscles are spread all over the body. In the limbs they are placed around the bones, one end of a muscle being usually attached by its tendon to one bone, and the other end to another. In the trunk or body they are spread out to inclose cavities;² and there they constitute a defensive wall, readily yielding to pressure, but resuming their original position when the pressure is removed.

3. There are more than five hundred muscles in the human

body, of various shapes, bound around, twining among, and lapping over each other, and running in almost every possible direction, according to their various uses. Every movement that is made by any part of the body requires the action of at least two muscles, one to draw the part one way, and the opposing muscle to yield to the movement, or to draw the part back again. The muscles are directed how to act by the *nerves*, which run from the brain to all parts of the body.

4. We can not swallow our food, draw the breath, move the eyes or head, bend the body, or move the limbs, without the employment of numerous muscles. It is by their action that the farmer cultivates his fields, the mechanic wields his tools, the sportsman pursues his game, the orator gives ut-



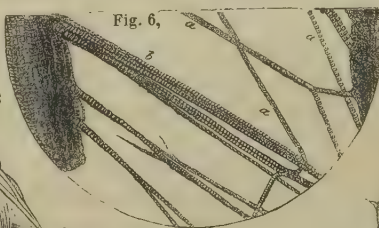
Fig. 5

Fig. 4, showing the bones, and only two of the muscles of the arm, is a representation of the manner in which all the joints of the body are moved. Here *h* is the upper bone of the arm, and *ra* and *u* the bones of the fore-arm. When the muscle *b* contracts, the muscle *c* relaxes, and the fore-arm is raised, turning on the joint *d*. When *c* contracts, and *b* relaxes, the fore-arm is extended.

In Fig. 5 are shown the muscles of the arm. The muscles marked 5 and 6 are used in moving the wrist. The one marked 8 extends all the fingers; while another, on the other side of the arm, closes them. The one marked 9 moves the little finger; 13 turns the hand sidewise, and also moves the arm; 10 and 14 turn the hand; 15 is the strong band that holds the muscles firmly in place around the wrist.

Fig. 6 shows a number of the small muscular fibres, *a*, *a*, *b*, torn from larger bundles. These are magnified two hundred times their real size. These fibres are really formed of little *cells* connected with each other.

At Fig. 7 is a greatly magnified representation of three of the muscular fibres cut



across (transversely), and showing the shape of the cells. Pressure has caused these cells to lose their rounded shape.



Fig. 4.

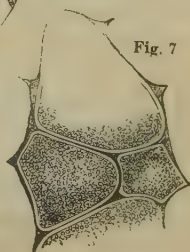


Fig. 7

terance to his thoughts, the lady touches the keys of the piano, and the young are whirled in the mazy dance. It will readily be seen, therefore, how much the pleasures and the employments of life depend upon their healthy action.

5. Some of the muscles, such as those which move the fingers, limbs, and trunk, act under the government of the will; but others, such as those which are used in breathing, and those used in moving the blood through the system, act wholly without the necessity of mental control. The former are called *voluntary*, and the latter *involuntary* muscles. Can any reason be given why the involuntary muscles should not be under the control of the will?

6. Like all other parts of the body, the muscles are nourished by the blood, one set of blood-vessels, the arteries, carrying the nourishing particles where they are needed, and another set, the veins, removing the decayed portions that are no longer of any use. Thus the blood is constantly depositing new matter, and removing that which is old and worthless.

7. The materials of which a muscle is composed are constantly passing away, like water under the influence of the noonday sun, and if no exercise be given to the muscle it soon becomes thin and flabby,³ it grows weak, and ere long loses its power of action. In this case the waste of matter is greater than the supply. But if proper exercise be given to the muscle, the movement of the blood in the artery which nourishes it is quickened, an abundant supply of nourishment is provided, and the muscle attains its perfect shape and full power of action. If only a few of the muscles of the body are exercised, they alone become firm, compact, and strong, while the others dwindle away.

8. The effect of vigorous⁴ exercise of one set of muscles is seen in the arms of the blacksmith, which not only increase in size, but become firm and hard; while, perhaps, other muscles of the body, called less frequently into use, are feebly developed.⁵ The hands and arms of the student are usually small and soft, and of a sickly hue, merely because, not being accustomed to vigorous exercise, they do not receive a suitable supply of nourishment.

9. The same law prevails throughout the entire body. If little or no exercise be taken, the whole body will be literally starved; for while the blood flows in a sluggish stream it very poorly performs its office of building up the system and keeping it in repair.

10. Yet, notwithstanding the importance of exercise, several cautions are necessary respecting it. The young, especially, should be guarded against taking too severe exercise, and against continuing it too long; for there is a point beyond which the muscles will be enfeebled, rather than strengthened, by exertion. Their healthy condition requires that exercise should be moderate at the commencement, and never continued so as to produce a feeling of exhaustion.⁶

11. "Begin with gentle toils; and as your limbs
Grow firm, to hardier, by just steps, aspire.
The prudent, even in every moderate walk,
At first but saunter; and by slow degrees
Increase their pace.
When, all at once, from indolence to toil
You spring, the fibres, by the hasty shock,
Are strained and tired, before their oily coats,
Compressed, can pour the lubricating balm.
Besides, collected in the passive veins,
The foaming blood a sudden torrent rolls,
O'erpowers the heart, and deluges the lungs
With sudden inundation."

12. An erect attitude while sitting, standing, or walking, is found to be most conducive to health, and to be attended with far less exhaustion of the muscles than a stooping position; for in the former case the muscles, being well balanced, mutually support each other. The spinal column should be kept erect, so far as possible, whatever occupations we may be engaged in, and the shoulders should be kept thrown back, that the chest may become broad and full. If a stooping posture be acquired in youth, we may be very certain that the deformity will continue to increase throughout life.

13. But whether the body be at rest, or in action, no one position of the muscles should be continued until weariness results from it. How often is it noticed that small children, after sitting a short time, become restless. Nature is warn-

ing them of the danger of violating her laws. A sitting or a standing posture occasions a continued strain upon certain sets of muscles; and rest, or change of position, is required for their relief. To one who has long been sitting, walking or running will often give the needed rest. We may learn from this the importance of giving to young and feeble children at school frequent out-door recreation.⁷

14. Moreover, the muscles should be exercised in pure air, and in the light, neither immediately before nor immediately after severe mental toil; and they should be rested gradually, by continuing some gentle exercise, when they have been vigorously used, and are greatly fatigued. They should never be so compressed by bandages or clothing as to restrain their free motions, unless the desire be to *starve* them into premature⁸ decay. The pressure of tight dresses, in females, enfeebles the muscles, and is a common cause of projecting shoulders, curvature of the spinal column, and consumption. What then shall we say of those fashions and modes of dress that violate all physiological⁹ laws? May they not justly be regarded as enemies of the human race?

15. "Knowest thou the nature of the human frame,
That world of wonders more than we can name?
Say, has thy busy, curious eye surveyed
The proofs of boundless wisdom there displayed?
Each *fibre* ranged with such amazing skill
That every *muscle* may attend thy will?
How every *tendon* acts upon its *bone*,
And how the *nerves* receive their nicer tone?
Convey the keen vibration¹⁰ of the sense,
And give the wakeful mind intelligence?
How some strong guard each vital part sustains,
How flows the *purple balsam*¹¹ through the veins?"

¹ SĪN'-EW (sin'-nu), a tendon.

² ĆĀV'-I-TĪES, hollows.

³ FLĀB'-BY, soft; hanging loose.

⁴ VĪG'-OR-OUS, active; powerful.

⁶ DE-VĒL'-OPED, filled out in size.

⁶ EX-HAUST'-ION, weariness; deprived of strength.

⁷ REC-RE-Ā'-TION, amusement; diversion.

⁸ PRE'-MA-TŪRE, before the proper time.

⁹ PHYS-I-O-LŌG'-I-CAL, pertaining to the laws of physiology or health.

¹⁰ VI-BRĀ'-TION, supposed motion of the nervous fluid.

¹¹ BĀL'-SAM, here used for the *blood*.

LESSON IV.

MUSCULAR EXERCISE AND MENTAL STIMULUS.

1. THERE is still another important principle connected with muscular exercise that must not be disregarded. The muscles depend, almost wholly, for their strength and activity, upon the *stimulus*¹ which they receive from the *mind*. Let the mind encourage them by pleasurable excitement, and they will labor long and actively with but little fatigue; but if the mind be unoccupied, gloomy, and desponding, the muscles will soon become weary.

2. That muscular power depends but very little upon the mere unaided strength of the muscular fibres, is shown by the fact that, when separated from the body, the muscle, which formerly sustained and raised a weight of one hundred pounds, will be torn asunder by a weight of ten pounds. And how has it lost all this power? Is it not because its appropriate mental stimulus has been taken away?

3. It is owing to the stimulus which the muscles receive from the mind that a sportsman will pursue his game for miles, not only without fatigue, but with a great degree of enjoyment, while a dull walk of half the distance would weary both mind and body. The same principle was well illustrated in the retreat from Russia of the defeated and dispirited French army. When no enemy was near, the French soldiers had hardly strength sufficient to carry their arms; but no sooner did they hear the report of the Russian guns, than new life seemed to pervade them, and they wielded their weapons powerfully until the foe was repulsed. Then, the mental stimulus being gone, there was a relapse² to weakness, and prostration followed.

4. It is thus with the invalid³ when riding or taking a walk for his health. If he have nothing to occupy his mind, he will be apt to return weary and dispirited; but let him have the pleasure of agreeable company, or be able to enjoy the charms of surrounding nature, and his ride or walk will refresh and invigorate⁴ him. So it is with the daily vocations⁵

of life. If the mind furnish the muscles with the appropriate incentive to exertion, the tiresomeness of labor will be greatly diminished. It is ever found that "cheerfulness sweetens toil," thus confirming the wisdom of Solomon, that "a merry heart doeth good like a medicine."

5. Physicians often avail themselves of the principle of combining mental excitement with muscular exertion in the treatment of their patients. Thus the Spectator⁶ tells an amusing story of the advice given by a physician to one of the Eastern kings. The physician brought him a heavy mallet, and told him that the remedy was concealed in the handle, and could act upon him only by passing into the palms of his hands when engaged in vigorously pounding with it, and that, as soon as perspiration should be induced,⁷ he might desist for the time, as that would be proof that the medicine was beginning to be received into the system.

6. The effect, we are told, was marvelous; and, looking to the principle just stated, to the cheerful mental stimulus arising from the confident expectation of a cure, and to the consequent advantages of exercise thus judiciously managed, we have no reason to doubt that the fable is in perfect accordance with nature.

7. Of a like character is the anecdote which has been related of a physician in London, who advised a dyspeptic⁸ patient, who had baffled all his remedies, to go and consult a celebrated physician several hundred miles distant in the country. On arriving at the place, the patient soon discovered that no such person lived there. The stimulus of expecting a cure, however, had been sufficient to enable the patient not only to bear the journey, but to reap benefit from it; and his wrath at finding no such person as had been described to him, and his anger on perceiving that he had been tricked, sustained him in returning, so that on his arrival home he was cured of his disease.

8. Cases like the following, illustrating the same principle, are not unfrequent. A gentleman immersed⁹ in the business and pleasures of a great city becomes disordered in health, and depressed in spirits. He receives much good advice from his medical friend, which he professes to follow with implicit

confidence, and proceeds to do so amid the anxieties of business, bad air, late hours, luxurious dinners, and nearly the total want of bodily exercise.

9. Deriving no benefit from all that is done for him, he hears of some celebrated springs, whose waters have acquired great reputation in the cure of stomach complaints; and at length he makes up his mind to proceed thither, though with little hope of deriving benefit from any thing. He now lays aside all business, lives by rule, keeps early hours, and is all day long in the open air. He soon recovers excellent health, and cordially concurs in spreading the fame of the water by which a cure so wonderful has been accomplished.

10. The advantages of combining harmonious mental excitement with muscular exertion, are thus noticed by Dr. Armstrong in his poem entitled the Art of Preserving Health:

*"In whate'er you sweat,
Indulge your taste. Some love the manly foils,¹⁰
The tennis¹¹ some, and some the graceful dance.
Others, more hardy, range the purple heath,
Or naked stubble, where, from field to field,
The sounding coveys¹² urge their lab'ring flight,
Eager amid the rising cloud to pour
The gun's unerring thunder. And there are
Whom still the meed¹³ of the green archer charms.
He chooses best whose labor entertains
His vacant fancy most. THE TOIL YOU HATE
FATIGUES YOU SOON, AND SCARCE IMPROVES YOUR LIMBS."*

¹ STĪM'-F-LUS, impulse; that which rouses to action.

² RE-LĀPSE', a sliding or falling back.

³ ĪN'-VA-LID, a person who is weak or infirm.

⁴ ĪN-VĪG'-OR-ĀTE, strengthen.

⁵ VO-CĀ'-TION, occupation; employment.

⁶ SPES-TĀ'-TOR, a series of papers written mostly by Addison.

⁷ ĪN-DĒCED', caused; occasioned.

⁸ DYS-PEP'-TIC, afflicted with bad digestion.

⁹ ĪM-MĒRSED', deeply engaged.

¹⁰ FOIL, a blunt sword used in fencing, or sword exercise.

¹¹ TĒN'-NIS, a game of ball.

¹² CŌV'-EY (kŭv'-y), plural cŏv'-eys, a small flock of birds.

¹³ MEED, reward; prize.

LESSON V.

ORGANS THAT PREPARE NOURISHMENT FOR THE BODY.
THE STOMACH, LIVER, PANCREAS, LACTEALS, AND SMALLER INTESTINES.

1. It has been stated that the bones and the muscles, and also all other portions of the body, are nourished and sustained by the blood; and that the blood is constantly conveying to them new particles of matter, and carrying away worn-out portions which are of no further use. As the blood has so much to do in the building and repairing of the "house we live in," it will be both interesting and useful to know something about the organs and the processes by which the blood itself is manufactured.

2. We will begin, therefore, by stating that the blood is manufactured from the food we eat. It may well be supposed, therefore, that the quality of the blood will depend considerably upon the quality of the materials used in its manufacture; for, while it is true that good wholesome food will make good blood, it is equally true that poor food will make poor blood. The "house we live in" can not be a very good one if made of poor materials. This subject, the manufacture of the blood, becomes, therefore, a very important one.

3. As is well known, the solid portions of our food are first divided by chewing. And here, we may remark, it is very desirable that the teeth should be firm and strong, and that they should be required to do their part of the work well. While they are doing their duty, several little sacs, or *glands*, near the sides of the mouth, throw into the mouth a liquid called *saliva*,¹ which moistens the food, so that it may glide easily down the throat into the stomach.

4. The next thing is to describe the stomach, and tell what that does toward manufacturing blood. The stomach is a kind of bag that will hold from a quart to three pints, according to the size and age of a person. It is formed chiefly of muscles, some running in one direction, and some in an

other, and the inner side is lined with vessels which contain a fluid called the *gastric juice*.

5. When food is received into the stomach, the blood-vessels of the stomach carry off any superabundance² of water that may be found there; then the gastric juice is poured upon the food to dissolve it, and the muscles of the stomach move the food about in every direction, so as thoroughly to mix it with the gastric juice. This operation is continued, with a strong and steady action, from two to four hours after a hearty meal, until the food is reduced to a thin paste. In this state it is called *chyme*.

6. As soon as any portion of the food is thus suitably prepared, the muscles, seeming to know their duty well, move it along to the small end of the stomach, where a little door or *valve* opens to let it pass through into the smaller intestines. This valve is a very faithful sentinel, always on duty; and if any portion of food not properly digested—that is, not reduced to chyme—makes its appearance there, this little valve will close against it, and turn it back into the stomach. The ancient Greeks gave to this valve the name *pylōrus*, which means “a door-keeper.” (See Figs. 9 and 10, page 33.)

7. There is one thing more very singular about this ever-watchful sentinel. While it will not, unless completely exhausted by fatigue, let indigestible food pass at all, it opens at once to let other substances pass, such as buttons, pieces of money, and little pebbles, that have been swallowed by mistake. For of what use would it be to keep *them* in the stomach? Mr. Pylōrus seems to know that *they* can not be digested at all, and that the easiest way to dispose of them is to let them pass on.

8. It sometimes happens that either too great a quantity of food, or food of a bad quality, has been taken into the stomach. The stomach, after a great amount of labor, and failing to digest it, tries to get rid of it by pushing it past the pylōrus. The pylōrus resists, and a struggle ensues. If the pylōrus yields first, the undigested food passes through, irritating³ the intestines as it moves along, and often producing severe sickness. But if the stomach yields first, its muscles endeavor to expel the unwholesome food in the other direction, and occasion what is called *vomiting*.

9. But suppose that good wholesome chyme has passed the doorway of the pylorus, what is the next step in the process? We are looking to see how blood is made from the food we have eaten. First, then, through a little channel the *liver* pours upon the chyme a quantity of that bitter yellow fluid called *bile*; then another organ, called the *pancreas*,⁴ pours upon it the *pancreatic juice*; some other juices are also poured in, and these liquids convert a portion of the chyme into a thin whitish fluid called *chyle*.*

10. As this chyle is carried along in the intestine it comes in contact with the mouths of numerous little veins, and also the mouths of numerous little hair-like tubes called *lacteals*,⁵ both of which absorb it, and convey it to what is called the *thoracic*⁶ *duct*; and this duct empties it into a large vein, which conveys it to the heart. After this it is sent to the lungs, where it is acted upon by the oxygen of the atmosphere, as we shall hereafter describe, when it becomes blood—a stock of fresh materials, suitable to aid in repairing, building up, and nourishing the body.

11. “For this the watchful appetite was given,
 Daily with fresh materials to repair
 This unavoidable expense of life,
 This necessary waste of flesh and blood.
 Hence the digestive powers, with various art,
 Subdue the ruder aliments⁷ to chyle;
 The chyle to blood; the foamy purple tide
 To liquors, which, through finer arteries,
 To different parts their winding course pursue,
 To try new changes, and new forms put on.”

12. But what does this blood, which circulates in our bodies, consist of? The blood of man consists of a colorless liquid, composed mostly of water, in which are seen floating a great number of very small, flat, circular atoms, or sacs, called disks or cells, a few of them white, but most of them red. If *twelve thousand* of these thin, flat cells were placed one upon another, they would make a pile of less than an inch in thickness! These cells seem to be a kind of living atoms, for

* Oils and fats are not digested in the stomach, but only after they have passed into the intestine, and been acted upon by the bile. They are then *absorbed* by the lacteals. Although we speak of the *mouths* of the lacteals, they are so small as to be invisible even by the aid of glasses, and may be considered as mere pores leading to those tubes.

they have their periods of birth, of growth, of decay, and of death; and they are nourished by the liquid in which they float. Countless myriads of them come into existence every day; and it is said that at every pulsation⁸ of the heart nearly twenty millions of them die. Has not physiology, then, its passing wonders, as well as astronomy? (See Fig. 8.)

13. While the blood, as a whole, has its own peculiar labors to perform in nourishing the body and removing its waste particles, each part of the blood has its separate duty. Thus the liquid in which the blood-cells float carries along the nourishing materials which are dissolved in it; but the business of the *cells* is to carry the oxygen. They take it in at the lungs, carry it where it is needed to burn up the waste particles of carbon and convert them into carbonic acid gas, and then go back for a new supply. What a wonderful process this is! But when the cells get old, and worn out in this labor, they shrivel up with age, they lose their bright crimson color, and assume a tawny hue like the decaying leaves of autumn, and at length they die—millions of them at every breath we draw. Some portions of their dead remains are used in repairs of the system, while other portions are strained off in the liver, and used for the manufacture of *bile*.

14. The relative position of the principal organs of the body, and the manner in which they are neatly packed to-

Fig. 8 represents a very small drop of human blood, containing the circular blood-cells magnified 500 diameters. As the blood-cells in other animals are not similar in size and shape to those found in man, the microscope will detect the difference.

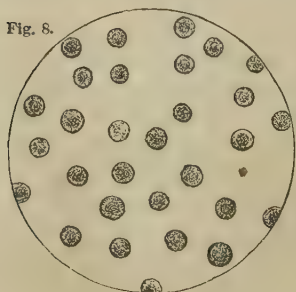


Fig. 8.

If we take a quantity of the blood of man, and analyze it, we shall find that in 1000 parts of it there are nearly the following proportions of various ingredients;

| | |
|-----------------------|---------------|
| Water | 784.00 |
| Albumen | 70.00 |
| Fibrin | 2.20 |
| Cells | 131.00 |
| Fats | 1.30 |
| Salts | 6.03 |
| Other substances. . . | 5.47 |
| | <hr/> 1000.00 |

The following is the composition of 1000 parts of the cells:

| | |
|----------------------------------|---------------|
| Water | 688.00 |
| Hæmatin (with iron) | 16.75 |
| Globulin and cell membrane | 282.92 |
| Fat | 2.31 |
| Extractive | 2.60 |
| Mineral substances | 8.12 |
| | <hr/> 1000.00 |

gether, may be seen in the drawing, Fig. 9, which we have given below. In the drawing Fig. 10 is a separate representation of the principal organs of digestion, which are engaged in manufacturing that life-bearing and life-preserving current, the blood, from the food we have eaten. He who made them, He who planned this curious manufactory, has assigned to them their duties; and faithfully will they keep laboring on in *our* service through a long life, if we furnish them the proper materials to work with, and guard them

EXPLANATION.—Fig. 9: *c* the windpipe. Back of the heart it branches to both lungs. *B, B*, the right and left lungs; *A*, the heart; *d*, the diaphragm, the muscle separating the chest from the abdomen; *D*, the stomach; *S*, the spleen (or milt), supposed by the ancients to be the seat of melancholy. Its use is not well determined. *C*, the liver, the largest organ in the body; *l*, the gall-bladder, on the under surface of the liver; *m, m*, the two kidneys, the right one the lowest; *V*, situation of the pylorus; *O*, the pancreas; *w, w*, the small intestine, sometimes called the second stomach; *f, f, f*, the colon, or large intestine.

Fig. 10: 3, the *œsoph'agus*, through which the food passes into the stomach; 13, cardiac orifice of the stomach; 14, splenic extremity; 15, pyloric extremity; 18, pylorus; 19, 20, 21, that part of the small intestine called the *du-o-de-num*; 22, gall-bladder; 23, cystic duct; 24, hepatic duct; 25, common gall duct; 26, its opening into the *du-o-de-num*; 27, duct of the pancreas opening into the *du-o-de-num*; 28 to 30, that part of the small intestine called the *je-jū-num*; 30 to 31, that part called the *il'e-um*; 31, opening of the *il'e-um* into the large intestine, or *co-lon*; 36, 37, 38, 39, the colon; 40, rectum.

Fig. 9.

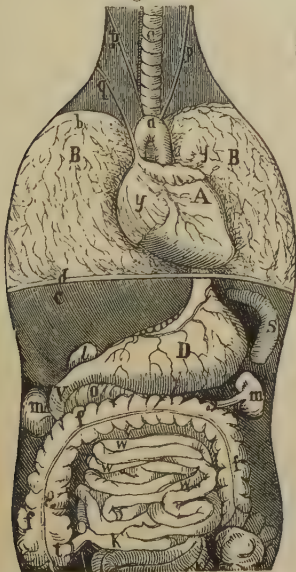


Fig 10.



from danger, and from the many abuses to which they are liable from our ignorance, our folly, and our neglect.

15. But oh! how sadly are these faithful servants often abused by us! How often do we give the stomach more labor than it can perform! How often do we fill it with crude⁹ and indigestible materials, until it rebels against our tyranny, or sinks exhausted in our service! How often do many poison it with vile drinks! How often do they neglect to give it the repose, which it needs! How generally are its laws of healthy action violated! And the sad consequences—are they not evident all around us, in thousands of cases of suffering, disease, and early death?

- | | |
|--|--|
| ¹ SA-Lŭ'-VA; when discharged from the mouth it is called spittle. | ⁶ THO-RĂC'-IC (tho-ras'-ik); the thoracic duct is the great trunk of the absorbent vessels. |
| ² SU-PER-A-BŪND'-ANCE, more than enough. | ⁷ ĂL'-I-MENT, food; nutriment. |
| ³ ÎR'-RI-TĂ-TING, causing unhealthy action. | ⁸ PUL-SĂ'-TION, the beating or throbbing of the heart. |
| ⁴ PĂN'-CRE-AS, a gland that pours out a kind of saliva. | ⁹ CRŪDE, unripe; raw. |
| ⁵ LĂC'-TE-ALS, these are slender hair-like tubes. | |

LESSON VI.

THE BEST COSMETICS.

HORACE SMITH.

1. YE who would save your features florid,
Lithe limbs, bright eyes, unwrinkled forehead,
From Age's devastation horrid,
 Adopt this plan—
'Twill make, in climate cold or torrid,
 A hale old man:
2. Avoid, in youth, luxurious diet;
Restrain the passions' lawless riot;
Devoted to domestic quiet,
 Be wisely gay;
So shall ye, spite of Age's fiat,
 Resist decay.
3. Seek not, in Mammon's worship, pleasure;
But find your richest, dearest treasure,

In books, friends, music, polished leisure :
The mind, not sense,
Made the sole scale by which to measure
Your opulence.

4. This is the solace, this the science,
Life's purest, sweetest, best appliance,
That disappoints not man's reliance,
Whate'er his state ;
But challenges, with calm defiance,
Time, fortune, fate.
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LESSON VII.

ABUSES OF THE DIGESTIVE ORGANS.—LAWS OF THEIR HEALTHY ACTION.

1. WE have seen not only that the bones and muscles are formed from the blood, and kept in repair by it, but that the blood itself is formed, by the labors of the digestive organs, out of the food provided for them. It will readily be seen, moreover, that the healthy action of these organs in manufacturing the blood must depend upon several conditions, such as the proper quantity and quality of the food supplied for them to work upon, the times and manner of the supply, and the condition of the system¹ when food is taken.

2. Without a suitable quantity of food, there will not be a sufficient quantity of blood to build up the body, and keep it in repair. When the body is growing rapidly, as in youth, more food is required as building material than when the period of youth has ended. This accounts for the keen appetite and vigorous digestion in childhood. For a similar reason, when the body has become emaciated² by disease, or want of nutriment, an increased supply is needed to repair the waste.

3. It has been seen that muscular exertion increases the flow of blood, for the purpose of repairing the waste that always attends action. Hence those accustomed to hard labor require a greater supply of food than those of inactive habits

or sedentary³ occupations. When, therefore, the amount of exercise is diminished, the quantity of food should be lessened; and if this principle be disregarded, the tone⁴ of the digestive organs will be impaired,⁵ and the health of the system enfeebled. The rule of *temperance*, and its happy results, are thus set forth by the poet Milton:

4.

"If thou wouldst observe

The rule of *not too much*, by temp'rance taught,
In what thou eat'st and drink'st, seek from thence
Due nourishment, not gluttonous delight,
Till many years over thy head return.
So may'st thou live, till, like ripe fruit, thou drop
Into thy mother's lap,⁶ or be with ease
Gather'd, not harshly plucked, for death mature."

5. As a general rule for the *quantity* of food required, it may be stated that no more should be taken, at any age, or in any condition of the body, than is barely sufficient to satisfy the *natural* appetite. By a natural appetite is to be understood an appetite that is not perverted by disease, nor by mental excitement; not stimulated by highly-seasoned dishes; and not vitiated⁷ by a long period of gormandizing.⁸ An unnecessary quantity of food oppresses the stomach, dulls the intellect, and causes general languor⁹ of the whole body.

6. While most kinds of *plain* food, including *ripe* fruits in general, may be said to be of good quality, yet some kinds contain a great amount of nutriment, and some but little. Those which contain a very great proportion of nutriment, such as butter, the oils, sugar, and fine flour, are found not to digest so readily as coarser articles of diet, and not to be so well adapted to the purposes of nutrition.

7. A dog fed on pure sugar, or olive oil, will soon become emaciated; but mix bran, or even saw-dust, with the sugar or the oil, and the vigor of the animal will be maintained for months. Feed a horse on grain alone, and he will soon die; but mix hay or straw with it, and no bad effects will be experienced. Our stomachs require, together with nutritious food, a suitable proportion of coarse and bulky, but not indigestible articles. Bread made from flour which contains a portion of the bran is far more conducive to health than that made from a finer material.

8. Animal food is found to be of a stimulating or warming character, while vegetables are the opposite. While both are adapted to nourish man, sometimes one is required, and sometimes the other. In childhood, when the organs are sensitive and excitable, a vegetable diet is usually the most appropriate, while to a person advanced in life an increased proportion of animal food is often found desirable. As a general rule, in the summer season a cooling vegetable diet is found most conducive to health; but those who are exposed to the cold of winter find increased comfort in a greater proportion of animal food.

9. Nature has adapted herself to this principle in stocking the waters of the frozen regions of the world with an abundant supply of animal life for food, while vegetable life abounds in the torrid zone. The temperament¹⁰ of the individual should also influence the choice of food; for while the dull and phlegmatic¹¹ may indulge with impunity¹² in a stimulating animal diet, the sanguine¹³ and excitable are liable to be injured by it.

10. Moreover, food should be taken at regular periods, and at sufficient intervals to allow the process of digestion to be completed, and the organs to obtain adequate repose before they are required to resume their labors. Food or drink taken very hot is a fruitful cause of decayed teeth, sore mouths, and indigestion; and when taken very cold it chills the stomach, and likewise arrests the digestive process.

11. Finally, food should not be taken immediately before nor immediately after severe mental exertion, or bodily toil, nor for, at least, three hours before retiring to sleep. While the brain is laboring under great excitement, the increased flow of blood to that organ causes the stomach to cease its labors; and if, during sleep, the process of digestion is continued, the labor required of the stomach will often cause unquiet rest and troublesome dreams. It is also supposed that, during sleep, the brain does not furnish the stomach the same mental stimulus as during waking hours.

¹ Sÿs'-TEM, an assemblage of things formed into a regular whole; here used for the whole body.
² E-MĀ'-OIĀ'-TED, thin; wasted away.
³ Sÿd'-EN-TĀ'-RY, inactive; accustomed to sit much.
⁴ TONE, healthy state or condition.
⁵ IM-PĀIR'-ED, injured; weakened.

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|--|--|
| <p>⁶ "MOTHER'S LAP," here used for the earth or grave.</p> <p>⁷ VĪ'-TĪ-TED (<i>vish'-a-ted</i>), injured; changed from a healthy state.</p> <p>⁸ GŎR'-MAND-ĪZ-ING, eating greedily, and too much.</p> <p>⁹ LĀN'-GUOR (<i>lang-gwor</i>), feebleness.</p> | <p>¹⁰ TĒM'-PER-A-MENT, state or constitution of the body.</p> <p>¹¹ PHLEG-MĀT'-IC, dull; sluggish.</p> <p>¹² IM-PŪ'-NĪ-TY, exemption from punishment.</p> <p>¹³ SĀN'-GUĪNE (<i>sang-gwin</i>), warm; ardent.</p> |
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LESSON VIII.

THE FABLE OF THE TWO BEES.

1. ONE fine morning in May, two bees set forward in quest¹ of honey; the one wise and temperate, the other careless and extravagant. They soon arrived at a garden enriched with aromatic² herbs, the most fragrant flowers, and the most delicious fruits. They regaled³ themselves for a time on the various dainties set before them; the one loading his thighs at intervals with wax for the construction of his hive, the other reveling⁴ in sweets, without regard to any thing but present gratification. At length they found a wide-mouthed phial, that hung filled with honey beneath the bough of a peach-tree. The thoughtless epicure,⁵ in spite of all his friend's remonstrances, plunged headlong into the vessel, resolving to indulge himself in all the pleasures of sensuality.⁶

2. The philosophic⁷ bee, on the other hand, sipped with caution; but, being suspicious of danger, flew off to fruits and flowers, where, by the moderation of his meals, he improved his relish for the true enjoyment of them. In the evening, however, he called for his friend, to inquire whether he would return to the hive, but found him surfeited⁸ in sweets which he was as unable to leave as to enjoy. Clogged in his wings, enfeebled in his legs, and his whole frame enervated,⁹ he was but just able to bid his friend adieu, and to lament with his latest breath that, though a taste of pleasure may quicken the relish of life, an unrestrained indulgence is inevitable¹⁰ destruction.

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| <p>¹ QUEST, search of.</p> <p>² AR-O-MAT'-IC, fragrant; having an agreeable odor.</p> <p>³ RE-GĀLED', feasted.</p> <p>⁴ REV'-EL-ING, feasting with noisy merriment.</p> <p>⁵ EP'-I-CURE, one who indulges immoderately in the luxuries of eating.</p> | <p>⁶ SENS-Ū-AL'-I-TY, unrestrained indulgence of the appetites.</p> <p>⁷ PHIL-O-SOPH'-IC, temperate and reasonable; acting like a philosopher.</p> <p>⁸ SUR'-FEIT-ED, filled to excess; cloyed.</p> <p>⁹ E-NEERV'-A-TED, weakened; enfeebled.</p> <p>¹⁰ IN-EV'-I-TA-BLE, certain; unavoidable.</p> |
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LESSON IX.

THE COMPLAINT OF A STOMACH.

CHAMBERS.

[The stomach, after having suffered much from the great and unnecessary amount of labor required of it, and from unseasonable meals, stimulating drinks, and want of rest, is supposed to make the following complaint.]

1. BEING allowed for once to speak, I would take the opportunity to set forth how ill, in all respects, we stomachs are used. From the beginning to the end of life, we are either afflicted with too little or too much, or not the right thing, or things which are horribly disagreeable to us; or are otherwise thrown into a state of discomfort. I do not think it proper to take up a moment in bewailing the Too Little, for that is an evil which is never the fault of our masters, but rather the result of their misfortunes; and, indeed, we would sometimes feel as if it were a relief from other kinds of distress, if we were put upon short allowance for a few days. But we conceive ourselves to have matter for serious complaint against mankind in respect of the Too Much, which is always an evil voluntarily incurred.

2. What a pity that in the progress of discovery we can now establish some means of a good understanding between mankind and their stomachs; for really the effects of their non-acquaintance are most vexatious. Human beings seem to be, to this day, completely in the dark as to what they ought to take at any time, and err almost as often from ignorance as from depraved¹ appetite. Sometimes, for instance, when we of the inner house are rather weakly, they will send us down an article that we could deal with when only in a state of robust health. Sometimes, when we would require a mild vegetable diet, they will persist in the most stimulating and irritating of viands.²

3. What sputtering we poor stomachs have when mistakes of that kind occur! What remarks we indulge in regarding our masters! "What's this, now?" will one of us say; "ah, detestable stuff! What a ridiculous fellow that man is! Will he never learn? Just the very thing I did not want.

If he would only send down a bowl of fresh leek soup, or barley broth, there would be some sense in it:" and so on. If we had only been allowed to give the slightest hint now and then, like faithful servants as we are, from how many miseries might we have saved both our masters and ourselves'!

4. I have been a stomach for about forty years, during all of which time I have endeavored to do my duty faithfully and punctually. My master, however, is so reckless, that I would defy any stomach of ordinary ability and capacity to get along pleasantly with him. The fact is, like almost all other men, he, in his eating and drinking, considers his own pleasure only, and never once reflects on the poor wretch who has to be responsible for the disposal of every thing down stairs. Scarcely on any day does he fail to exceed the strict rule of temperance; nay, there is scarcely a single meal which is altogether what it ought to be. My life is therefore one of continual worry and fret; I am never allowed to rest from morning till night, and have not a moment in the four-and-twenty hours that I can safely call my own.

5. My greatest trial takes place in the evening, when my master has dined. If you only saw what a mess this said dinner is—soup, fish, flesh, fowl, ham, rice, potatoes, table-beer, sherry, tart, pudding, cheese, bread, all mixed up together. I am accustomed to the thing, so don't feel much shocked; but my master himself would faint at the sight. The slave of duty in all circumstances, I call in my friend Gastric Juice, and we set to work with as much good-will as if we had the most agreeable task in the world before us. But, unluckily, my master has an impression very firmly fixed upon him that our business is apt to be vastly promoted by an hour or two's drinking; so he continues at table among his friends, and pours down some bottle and a half of wine, perhaps of various sorts, that bothers Gastric Juice and me to a degree which no one can have any idea of.

6. In fact, this said wine undoes our work almost as fast as we do it, besides blinding and poisoning us poor servants into the bargain. On many occasions I am obliged to give up my task for the time altogether; for while this vinous³ shower is

going on I would defy the most vigorous stomach in the world to make any advance in its business worth speaking of. Sometimes things go to a much greater length than at others; and my master will paralyze⁴ us in this manner for hours, not always, indeed, with wine, but occasionally with punch, one ingredient of which—the lemon—is particularly odious to us. All this time I can hear him jollifying away at a great rate, drinking healths to his neighbors, and ruining his own.

7. I am a lover of early hours, as are my brethren generally. To this we are very much disposed by the extremely hard work which we usually undergo during the day. About ten o'clock, having, perhaps, at that time got all our labors past, and feeling fatigued and exhausted, we like to sink into repose, not to be again disturbed till next morning at breakfast-time. Well, how it may be with others I can't tell; but so it is, that my master never scruples to rouse me up from my first sleep, and give me charge of an entirely new meal, after I thought I was to be my own master for the night. This is a hardship of the most grievous kind.

8. Only imagine me, after having gathered in my coal, drawn on my night-cap, and gone to bed, called up and made to take charge of a quantity of stuff which I know I shall not be able to get off my hands all night! Such, O mankind, are the woes which befall our tribe in consequence of your occasionally yielding to the temptations of "a little supper." I see turkey and tongue in grief and terror. Macarōni⁵ fills me with frantic alarm. I behold jelly and trifle⁶ follow in mute despair. O that I had the power of standing beside my master, and holding his unreflecting hand, as he thus prepares for my torment and his own!

9. Here, too, the old mistaken notion about the need of something stimulating besets him, and down comes a deluge of hot spirits and water, that causes me to writhe in agony, and almost sends Gastric Juice off in the sulks to bed. Nor does the infatuated man rest here. If the company be agreeable, one glass follows another, while I am kept standing, as it were, with my sleeves tucked up, ready to begin, but unable to perform a single stroke of work.

10. I feel that the strength which I ought to have at my

present time of life has passed from me. I am getting weak, and peevish, and evil-disposed. A comparatively small trouble sits long and sore upon me. Bile, from being my servant, is becoming my master; and a bad one he makes, as all good servants ever do. I see nothing before me but a premature old age of pains and groans, and gripes and grumblings, which will, of course, not last over long; and thus I shall be cut short in my career, when I should have been enjoying life's tranquil evening, without a single vexation of any kind to trouble me.

11. Were I of a revengeful temper, it might be a consolation to think that my master—the cause of all my woes—must suffer and sink with me; but I don't see how this can mend my own case; and, from old acquaintance, I am rather disposed to feel sorry for him, as one who has been more ignorant and imprudent than ill-meaning. In the same spirit let me hope that this true and unaffected account of my case may prove a warning to other persons how they use their stomachs; for, they may depend upon it, whatever injustice they do to *us*, in their days of health and pride, will be repaid to *themselves* in the long-run—our friend Madame Nature being a remarkably accurate accountant, who makes no allowance for ignorance or mistakes.

¹ DE-PRĪV'ED, corrupted; made bad.

² VĪ'-ANDS, food; meat dressed.

³ VĪ'-NOUS, pertaining to wine.

⁴ PĀR'-A-LŪZE, render unable to act.

⁵ MAC-A-RŌ'-NĪ, a kind of dry paste made of wheat flour.

⁶ TRĪ'-FLE, a dish composed of layers of sweetmeats and cake, with syllabub.

LESSON X.

CORNARO THE ITALIAN.

1. CORNARO was an Italian, who, by the simplest diet, a quiet mode of life, and an unexampled perseverance in his plan, happily attained to a great age, which richly rewarded him for his self-denial, and gave an instructive lesson to posterity.

2. One can not read the history of the life and abstinence of this veteran of a hundred years, and hear how he praises that serenity and contentment for which he was indebted to

his mode of living, without participating¹ in his happiness and his cheerful sensations.

3. Till the fortieth year of his age, Cornaro had led a life of dissipation.² He had always been subject to colics, pains in the limbs, and frequent attacks of fever. He was so far reduced by the last that his physician assured him he could not live above two months; that all medicine would be useless; and that the only thing which could be recommended for him was a spare diet.

4. Having followed this advice, Cornaro found, after some days, that he was much better; and at the end of a few years his health was not only perfectly re-established, but he became sounder than he had ever been before. He resolved, therefore, to restrain himself more and more, and to use nothing except what was absolutely necessary for his subsistence.

5. For sixty whole years he took no more than twelve ounces of solid food and thirteen ounces of drink daily. He avoided, also, violent heat and cold, as well as all excitement and passion; and by this uniform mode of life he kept not only his body, but his mind also, in such a state of equality that nothing was able to derange them.

6. When at a great age he lost an important lawsuit; and though this disappointment hurried two of his brothers to the grave, he remained perfectly sound and resigned. He was once thrown from a carriage and trodden under the feet of the horses, so that an arm and one of his feet were dislocated,³ but by a still more temperate diet, and without the use of any medicine, he was soon restored to his former condition.

7. But what is most worthy of remark, and proves how dangerous the smallest deviation from long custom may be, is what follows: When he was eighty years of age his friends prevailed upon him to make a little addition to his food, in the belief that his body now required more nourishment. Though well aware that with the general decay of strength the power of digestion decreases also, and that in old age one ought rather to lessen than increase the quantity of nourishment, he gave way to their request, and raised his food to fourteen, and his drink to sixteen ounces.

8. "Scarcely," says he, "had I continued this mode of liv-

ing ten days when I began, instead of being lively and cheerful as before, to become uneasy and dejected, a burden to myself and to others. On the twelfth day I was seized with a pain in my side, which lasted twenty-four hours, and this was followed by a fever which continued with so much violence for thirty-five days that my life was despaired of; but, by the blessing of God, and my former temperate mode of life, I recovered, and now, in my eighty-third year, I enjoy a happy state both of body and mind.

9. "I can mount my horse without assistance; I climb steep hills; and I have lately written a play abounding in innocent wit and humor. When I return from a private company, or the senate, I find eleven grandchildren, whose education, amusement, and songs are the delight of my old age. I often sing with them, for my voice is now clearer and stronger than it ever was in my youth; and I am a stranger to those peevish⁴ and morose⁵ humors⁶ which fall so often to the lot of old age." In this happy disposition the wise and virtuous Cornaro attained to his hundredth year, but his example has seldom, if ever, been imitated.

¹ PĀR-TĪŌ'-I-PĀ-TING, taking part in; par-⁴ PEE'-VISH, fretful.

taking.

² DIS-SI-PĀ'-TION, a dissolute or intemper-⁵ MO-RŌSE', sour; sullen.

ate course of life.⁶ IIŪ'-MORS, peculiarities of temper or disposition.

³ DĪS'-LO-CĀ-TED, put out of joint.

LESSON XI.

ADVANTAGES OF TEMPERANCE IN DIET.

HITCHCOCK.

1. TEMPERANCE promotes clearness and vigor of intellect. If the brain be not in a healthy and vigorous state, equally unhealthy and inefficient must be the mind also. History will bear us out in asserting, that the highest and most successful intellectual¹ efforts have ever been associated with the practice of those general principles of temperance in diet for which we plead.

2. It is the mighty minds that have grappled most successfully with the demonstrations² of mathematical, intellectual, and moral science, that stand highest on the scale of mental

acumen³ and power; and it is such minds that have found strict temperance in diet essential to their success. Let us advert to the history of a few of the master spirits of the human race.

3. Foremost on the list stands that eminent philosopher and mathematician, Sir Isaac Newton. The treatise⁴ of his, that cost him the mightiest intellectual effort of all his works, was composed while the body was sustained by bread and water alone. And in spite of the wear and tear of such protracted and prodigious mental labor as his, that same temperance sustained him to his eighty-fifth year.

4. That celebrated intellectual philosopher, John Locke, with a feeble constitution,⁵ outlived the term of threescore⁶ years and ten by his temperance. "To this temperate mode of life, too, he was probably indebted for the increase of those intellectual powers, which gave birth to his great work on the human understanding, his treatises on government and education, as well as his other writings, which do so much honor to his memory."

5. Another intellectual philosopher, who saw fourscore years, was the venerable Kant. "By this commendable and healthy practice," early rising, says his biographer, "daily exercise on foot, temperance in eating and drinking, constant employment, and cheerful company, he protracted his life to this advanced period;" and we may add, acquired the power for his immense labors of mind.

6. Few men have more fully established their claims to intellectual superiority of a very high grade than that American theologian, President Edwards. But it was temperance alone that could carry him through such powerful mental efforts. "Though of a delicate constitution, by the rules of temperance he enjoyed good health, and was enabled to pursue his studies thirteen hours a day."

7. The same means enabled the great German reformer, Martin Luther, though his days were stormy in the extreme, to make the moral world bend to his will, and to leave for his posterity so many profound literary productions. "It often happened," says his biographer, "that for several days and nights he locked himself up in his study, and took no

other nourishment than bread and water, that he might the more uninterruptedly pursue his labors."

8. The records of English jurisprudence⁷ contain scarcely a name more distinguished than that of Sir Matthew Hale. And it is the testimony of history, that "his decided piety and rigid temperance laid him open to the attacks of ridicule; but he could not be moved." In eating and drinking, he observed not only great plainness and moderation, but lived so philosophically that he always ended his meal with an appetite.

9. Perhaps no man has accomplished more for the world than he who has written such a commentary on the Scriptures as that of Matthew Henry. And it is, indeed, an immense literary labor. But the biographer's account of that writer's habits shows that temperance and diligence were the secret of his success.

10. Few men have accomplished more than the distinguished Methodist divine, John Wesley; and it is gratifying to learn that it was "extraordinary temperance which gave him the power to do so much, and to live so long."

11. In reading the poetical works of Milton, we are not so much delighted with the play of imagination, as with the rich and profound views which he opens before us. The fact is, he was a man of powers and attainments so great as justly to be classed among the leading intellects of the world. Nor were such powers and attainments disjoined⁸ from temperance.

12. Europe, as well as America, has been filled with the fame of Franklin, the philosopher; and no less wide spread is the history of his temperance. Early in life he adopted a vegetable diet; and thus he not only gained time for study, but "I made the greater progress," says he, "from that greater clearness of head and quickness of apprehension which generally attend temperance in eating and drinking." The habit of being contented with a little, and disregarding the gratifications of the palate,⁹ remained with him through life.

¹ IN-TEL-LĒCT'-Ū-AL, pertaining to the mind or intellect.

² DEM-ON-STRA'-TION, the act of stating and proving truths.

³ A-CŪ'-MEN, quickness of mind; readiness.

⁴ TRĒAT'-ISE (*treet'-is*), a written work.

⁵ CON-STI-TŪ'-TION, bodily system; the human body itself.

⁶ THREE'-SCORE, a score is twenty.

⁷ JU-RIS-PRŪ'-DENCE, the science of law.

⁸ DIS-JOINED', separated from.

⁹ PĀL'-ATE, taste; the appetite.

LESSON XII.

THE CONFESSION.

BLACKWOOD'S MAGAZINE.

1. There's somewhat on my breast', father',
 There's somewhat on my breast'!
 The live-long day I sigh', father',
 At night I can not rest';
 I can not take my rest', father',
 Though I would fain¹ do so,
 A weary weight oppresseseth me—
 The weary weight of woe!
2. 'Tis not the lack of gold', father',
 Nor lack of worldly gear';²
 My lands are broad and fair to see,
 My friends are kind and dear;
 My kin are leal³ and true', father',
 They mourn to see my grief',
 But, O! 'tis not a kinsman's hand
 Can give my heart relief!
2. 'Tis not that Janet's false', father',
 'Tis not that she's unkind';
 Though busy flatterers swarm around,
 I know her constant mind.
 'Tis not her coldness', father',
 That chills my laboring breast',
 It's that confounded⁴ cucumber
 I've eat,⁵ and can't digest!

¹ FAİN, gladly; with joy or pleasure.² GĒAR, clothing; ornaments; possessions.³ LĒAL (Scottish), faithful.⁴ CON-FOUND'-ED, that which ought to be condemned.⁵ "I've eat," a poetic license for "*I have eaten*."

Temperance is the best physic.

The best physicians are Dr. Diet, Dr. Quiet, and Dr. Merryman.

Diet cures more than the lancet.

LESSON XIII.

THE ORGANS OF CIRCULATION AND OF RESPIRATION:

THE HEART, ARTERIES, CAPILLARIES, VEINS, AND LUNGS.

1. NEAR the centre of the upper portion of the body, but a little on the left side, is the *heart*, the great working engine which sends the blood to all portions of the system, to do its work of building up and keeping in repair the house we live in. We have given a brief account of the formation of the blood—the material which the heart uses; and we now proceed to describe the manner in which this building and repairing process is carried on.

2. We will commence by informing you that your *heart*, a drawing of which we place before you, is a strong muscular organ, but little larger than your fist, and containing four cavities. The upper cavity on the right side, which is called the *right auricle*,¹ receives the blood from the body through a number of large *veins*; this auricle then contracts² by the power of its muscles, and forces the blood into the cavity below it, called the *right ventricle*.³ The right ventricle then contracts and sends the blood to the lungs; the *left auricle*, which is the upper cavity on the left side of the heart, receives the blood back from the lungs, and forces it into the *left ventricle* below it; and the left ventricle forces the blood through the *arteries* all over the body.

3. This is a very brief explanation of the labor which the heart has to perform in circulating the blood. But now let us trace the course which the blood takes, from the time when it is received from the body into the right auricle until it has performed its round of circulation and gets back again; then we shall begin to realize what a curious and wonderful piece of machinery these circulating and breathing organs are.

4. When the blood is received into the right auricle of the heart it is of a dark color, and full of the waste and impure particles which it has received from all parts of the body. If this impure blood should be sent in this condition throughout the body, death would very soon be the result. The

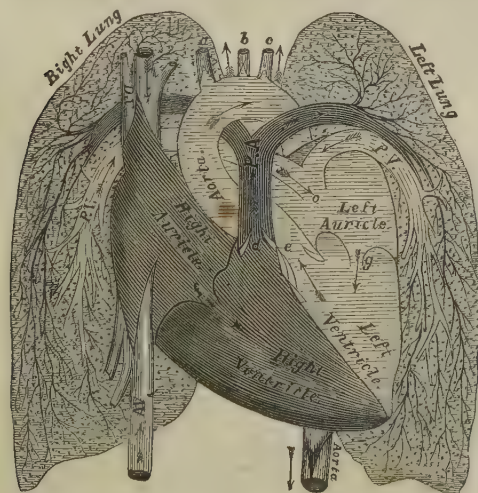
blood, therefore, must be cleansed, and the impure particles thrown away, and for this purpose the right ventricle takes charge of it and sends it to the lungs.

5. But how can the lungs purify the blood? In order to explain how, we must first describe the lungs themselves. The lungs are large sponge-like masses, which fill up nearly the whole cavity of the chest on each side of the heart. The air which we breathe passes into them; and through a vast number of little channels, which terminate in very minute air-cells, it is brought in contact with every portion of the sponge-like structure of the lungs. *Lizzie Ford.*

6. The arteries which run from the right ventricle to the lungs branch out in millions of little tubes, not so large as a

Fig. 11.

CIRCULATION OF THE BLOOD THROUGH THE HEART AND LUNGS.



The *Right Auricle* receives the impure venous blood from the body through the veins *D.V.* (the *descending vena cava*), and *A.V.* (the *ascending vena cava*).

At *f* is the opening through which the blood is forced into the right ventricle. Here is the *tricuspid valve*, which closes when the blood attempts to return.

The *Right Ventricle*, by contracting, forces the impure blood through the two branches of the pulmonary artery (*P.A.*) into both lungs. The lids of the valve at *d* would close if the blood should attempt to return.

The blood, having been purified in the lungs and lost its dark color, is sent back to the heart through several canals, which form at length four large trunks called *pulmonary veins*, and these terminate in the *Left Auricle* by one

common opening, as seen at *o*. Only two of these pulmonary veins, *P.V.*, *P.V.*, are seen in the drawing.

The *Left Auricle* forces the blood into the *Left Ventricle*, through the opening *g*, where is placed the *mitral valve* to prevent its return. The *Left Ventricle* then forces the blood into the large artery called the *aorta*, which distributes it to all parts of the body, to be returned again to the *Right Auricle* through the veins *A.V.* and *D.V.*

When the blood is forced into the *aorta*, the lids of the valve at the entrance *e* fall back against the sides of the artery; but when the blood attempts to return, they come together and prevent it.

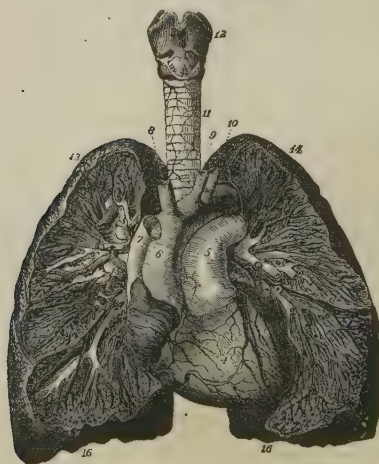
At *a*, *b*, and *c* are arteries branching off from the *aorta* to the head, arms, etc.

hair, all over the air-channels and air-cells of the lungs, and by them the blood is brought into close contact with the air we breathe. The impure particles of the blood, which are found chiefly in what we shall hereafter describe as *carbonic acid gas*, are now thrown into the air-cells and air-channels, and breathed out of the body through the mouth and nostrils in the form of vapor. At the same time, the remaining blood in the blood-vessels of the lungs takes in a portion of *oxygen* from the air, and receives thereby a bright red color, very different from the dark hue it had on entering the lungs. The blood, being thus purified, is returned to the heart, from which it is again sent forth through channels called *arteries* to every part of the body.

7. These arteries branch out into the smallest tubes that can be conceived, many of them invisible to the naked eye. They spread over every muscle and bone in the body, and throughout the skin, and from the blood thus received every part of the body is built up.

8. How wonderful it is that this single fluid—formed, perhaps, as it may be, out of some one simple material, such as the

Fig. 12.
THE HEART AND LUNGS, WITH THE OUTER COVER-
ING OF THE LUNGS REMOVED.



While Fig. 11 is a diagram designed to show the manner in which the blood circulates through the heart and lungs, and can not, therefore, be a strictly accurate drawing of those organs, Fig. 12 is a true representation of the heart in its natural position, showing also the lungs, after their front outer covering has been removed.

At 12 is the *lär'-yna*, or upper part of the windpipe; 11 is the *trä'-che-ä*, or windpipe, which conveys air to the lungs. Back of the upper part of the heart the *trä'-che-ä* divides into the two *bronchial tubes*. These bronchial tubes branch out all over the lungs in minute subdivisions, and ultimately terminate in a vast number of minute air-cells, from the twentieth to the hundredth of an inch in diameter. These air-cells are so numerous that the amount of surface contained in their lining membrane in man has been computed to exceed 140 square feet!

At 1 is seen a part of the left auricle, most of this auricle being on the back part of the heart; 2, right auricle; 3, left ventricle; 4, right ventricle; 5, pulmonary artery; 6, aorta; 7, descending vena cava; 13, upper lobe of right lung; 14, upper lobe of left lung; 16, 16, lower lobes of lungs.

potato—should be capable of being put to so many different uses! that out of it the brittle bones are made, the soft and pulpy brain, the hard and horny nails, the silky hair, the flesh, the fat, the skin, the bitter bile, the salt perspiration, every thing, in fact, from the sweat on the brow of labor to the dew on the lip of beauty! And yet such is the case. A mysterious power, engaged in building up and nourishing our bodies, is constantly working within us—a power which we can not fathom, which we can not comprehend. He only, who created it, knows the hidden causes of its action.

9. At the ends of the myriads⁴ of minute channels in which the arteries terminate, are the beginnings of other minute channels which receive the blood, and use it in repairing the body. All these minute hair-like blood-vessels, which connect the arteries and the veins, are called *capillaries*.⁵ Into the returning veins such particles of the body as are worn out and useless are carried by the capillaries, and thus the blood again begins to be filled with impurities; and by the time it gets back to the right auricle of the heart it is a dark and filthy stream, and must be again sent to the lungs to have its color and its purity restored.

10. Such is the circuit which the blood is constantly making, in carrying on the repairs of the system, and removing its waste particles. And all the blood in the body, which is estimated at nearly ten quarts in a person of full size, is supposed to pass through the heart as often as once in six or eight minutes. The heart is the great engine which keeps it in motion. And so long as life lasts, it keeps beating away, stroke after stroke—sometimes seventy or eighty, and sometimes more than a hundred and fifty times in a minute—forcing the blood onward through the arteries, dispersing it through the capillaries, receiving it back through the veins, never stopping a moment, and never wearying of the labor which God has assigned to it.

11. And all this it does without any thought of ours, and without any direction from us. Its action is *involuntary*—that is, it is not, like the movements of our hands and feet, dependent on our will. Our will can not even *stop* its action; for it works by a will greater than ours, by the will of

Him who made it, whose servant *it* is, and whose servants *we* are. Yet its labors gradually wear upon it; it can not keep going forever. It seems strange to us that it should keep going so long. But though it may exert itself millions of times in our service, each pulsation brings it nearer and nearer to the end.

“Art is long, and time is fleeting;
And *our hearts*, though stout and brave,
Still, *like muffled drums*, are beating
Funeral marches to the grave.”

¹ AU'-BI-CLE (from the Latin *auris*, an ear), so called from its supposed resemblance to the ear of a quadruped.

² CON-TRACTS', draws together.

³ VĒN'-TRI-CLE; this word is applied, gen-

erally, to *cavities* in animal bodies. There are *ventricles* in the brain.

⁴ MÿR'-I-ADS, countless numbers.

⁵ ĆĀP'-IL-LA-RIES (from the Latin *capillus*, a hair), long hair-like tubes.

LESSON XIV.

A HYMN.

1. WHEN I with curious eyes survey
My complicated frame,
I read in every part inscribed
My great Creator's name.
2. He bade¹ the purple flood of life
In circling streams to flow,
And sent the genial heat around,
Through every part to glow.
3. My heaving lungs, while they have power
To fan the vital frame,
Shall sing thy praises, O my God!
Thy wond'rous skill proclaim.

¹ Pronounced BĀD.

AIR AND EXERCISE.

LONDON QUARTERLY REVIEW.

SPECIAL attention should be given, both by parents and teachers, to the physical development of the child. Pure air and free exercise are indispensable, and wherever either of

these is withheld, the consequences will be certain to extend themselves over the whole future life. The seeds of protracted and hopeless suffering have, in innumerable instances, been sown in the constitution of the child simply through ignorance of this great fundamental physical law; and the time has come when the united voices of these innocent victims should ascend, "trumpet-tongued," to the ears of every parent and every teacher in the land. "Give us free air and wholesome exercise; give us leave to develop our expanding energies in accordance with the laws of our being; give us full scope for the elastic and bounding impulses of our youthful blood!"

LESSON XV.

ABUSES OF THE LUNGS.

1. As the chief office of the lungs is to purify the blood, through the medium of the air which is taken into them in breathing, it will readily be seen that if impure air be inhaled,¹ the blood will not be purified. Pure air is composed chiefly of two invisible gases, which are always mixed in exactly the same proportions—that is, a hundred pounds of pure air consist of twenty-one pounds of *oxygen* and seventy-nine of *nitrogen*. The proportions are the same whether the air be collected on the top of high mountains, over marshes, or over deserts.

2. When this air is taken into the lungs, the blood sent there from the heart is purified in the following manner. The oxygen of the air, having a strong affinity for the blood—that is, having a strong tendency to unite with it—leaves the nitrogen, and, passing into the blood-vessels, mixes there with the blood and the chyle, and completes the process of changing the latter into pure blood. This is the first step in the process. The second is the following:

3. The waste particles of the body consist chiefly of a substance called *carbon*, which has a strong affinity for oxygen—that is, it unites readily with it. The union of carbon and oxygen forms what is called *carbonic acid gas*, which is a

poison to the body, and needs to be removed from it. This union of the waste particles of the body with oxygen is effected in the capillary blood-vessels which we have before described; and the impurities of the blood in the veins are thus changed into carbonic acid gas, for the purpose of being easily removed. When the blood reaches the lungs, the carbonic acid gas, which mixes readily with the air, is thrown off through the mouth and nostrils in the process of breathing. Thus the process of purifying the blood is completed.

4. It is the chemical² union of carbon and oxygen in the capillary vessels that gives *warmth* to the body. When a piece of wood is *burned* in the open air, the same kind of union between the carbon of the wood and the oxygen of the air takes place, and *carbonic acid gas* is produced by the fire, the same as by the union of carbon and oxygen in our bodies. Thus there is a slow fire constantly burning within us. The stomach provides the fuel, the lungs supply the oxygen to consume it, the arteries carry the fuel and fire to the capillaries, where the combustion³ takes place, and the smoke passes off through the mouth and nostrils. If we should allow that fire to go out by not providing a supply of carbon in our food, and of oxygen in the air we breathe, the result would be death.

5. The poisonous carbonic acid gas, whether thrown off from the lungs or produced by combustion, can not be inhaled without danger, as it not only furnishes no oxygen for purifying the blood, but it adds additional poison to it. The quantity of this gas thrown off from the lungs of a man is not less than twenty-four cubic inches each minute, or more than six gallons during an hour; and, at the same time, an equal quantity of oxygen is withdrawn from the air around him, so that a very large quantity of air is thus rendered impure, and unfit to be taken into the lungs.

6. We see at once, therefore, the danger of breathing over again our own breath, or the breath of others. When a person sleeps with his head covered by the bedclothes, he is breathing poisoned air; and, if he sleeps in a small and close room, he is in danger from the same cause. A close room,

crowded with persons, soon becomes so filled with the poisonous gas as to produce a kind of stupor⁴ and violent headache in those who breathe it. Crowded school-rooms, churches, and all public assembly rooms, therefore require to be ventilated⁵ by the constant or frequent admission of fresh air, in order to remove the poison and furnish a new supply of oxygen.

7. Many sad results have occurred from an ignorance or disregard of this principle, but we have room to cite only one. In the year 1756 one hundred and forty-six Englishmen were shut up in Calcutta, in a room called the Black Hole, which was a confined space, partly underground, and only eighteen feet square. There were only two very small windows by which air could be admitted, and, as both of these were on the same side, a free ventilation was utterly impossible.

8. Scarcely was the door closed upon the prisoners when their sufferings commenced, and in a short time a delirious⁶ and mortal⁷ struggle ensued to get near the windows. Within four hours those who survived lay in the silence of apoplectic⁸ stupor; and, at the end of six hours, *ninety-six* had been relieved by death. In the morning, when the door was opened, only twenty-three were found alive; and many of these were subsequently carried off by putrid fevers, caused by the poisonous air which they had breathed.

9. As combustion can not be produced in common air without consuming oxygen, and giving out in its place carbonic acid gas, an open fire in a close room must render the air impure. If a lighted taper be placed in a closed jar containing common air, the oxygen will soon be burned up, its place will be supplied with carbonic acid gas and vapor, and the light of the taper will be extinguished. If a living animal, a mouse, for example, be now placed in the jar, and especially at the lower part of it, the animal will almost immediately go into convulsions,⁹ and die in two or three minutes.

10. As pure charcoal consists wholly of carbon, the burning of charcoal produces a large quantity of carbonic acid gas; and every year cases occur of individuals having lost their lives by entering close rooms in which charcoal was

burning. As this gas is much heavier than common air, it may occupy the lower portion of a room near the floor, while the air above may be nearly free from its influence. Persons have also lost their lives by descending into deep pits, wells, and mines, which contain carbonic acid gas. Before venturing into such places the precaution should be used of letting down a lighted candle; if the light be extinguished, or burn feebly, carbonic acid may be known to exist there.*

11. From the principles explained, it must be evident to every one that whatever deprives the lungs of their natural supply of oxygen, prevents the complete purification of the blood, by retaining the poisonous carbonic acid gas in the system, thereby sowing the seeds of disease and death. When air is taken into the lungs in breathing, so as to fill them, the lungs swell out, and the chest enlarges by its own free action, so as to give them an abundance of room; but if the muscles and ribs of the chest be restrained by pressure from expanding freely, the required supply of oxygen can not be obtained.

12. And yet, notwithstanding all that has been said and written on this subject, there are those who scarcely seem to

The effect produced upon the ribs by compressing the chest, through a long continued practice of tight lacing, may be seen in Fig. 14, which is no caricature, but is what is often seen in real life. In Fig. 13 the ribs are seen in their natural healthy position, gradually swelling out from above, and affording abundance of room for a full inflation of the lungs. In Fig 14 the chest has been made by tight lacing to assume the form of an inverted cone; the ribs are brought much more closely together than is natural, and pressed downward; and the capacity of the lungs is diminished nearly one half. In the same proportion is the supply of oxygen diminished, and the impurities of the blood retained in the system.

Fig. 13.

THE SKELETON AS NATURE FORMED IT.

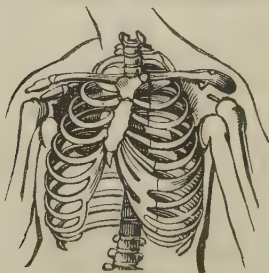
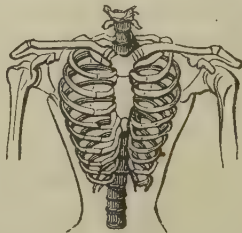


Fig. 14.

THE SKELETON AS DEFORMED BY ART.



* When discovered it may often be absorbed by quick lime, if it can not be drawn off or dissipated by ventilation.

be aware, if we may judge from their actions, that any harm can arise from compressing the ribs, and thereby preventing the free expansion of the lungs! Many will doubtless be startled on being seriously told that *tight lacing* of the chest poisons the current of life at its fountain head! But there is abundant warrant for the oft-repeated assertion, however harsh it may seem, that this practice is only a fashionable mode of self-murder! Yet weak-minded mothers, as devoid of correct taste as they are destitute of just notions of parental duty, and holding a silly fashion dearer than life itself, continue to initiate their daughters in this folly and wickedness; and they begin this torture of their children at the tender age when the bones of the body are so soft and yielding, that they soon *grow* into the deformity with which Art attempts to supplant Nature!

13. The consequences of compressing the chest by tight lacing, or by *tight-fitting dresses*, as described by all physicians and physiologists, are usually these. If the victim be originally strong and robust, the flushed face soon indicates the torture which the brain endures. Nature, restrained in one direction, makes known its wants in another, and gives undue expansion to the head, arms, and shoulders, and lower extremities. The hands and feet become large and clumsy, the spine becomes distorted, and the body is made crooked. But persevering Art at length overcomes the energy of Nature, and a long train of nervous affections gradually tortures the victim to death.

14. But if, on the other hand, the victim be originally frail and delicate, Nature is soon conquered, and the final result is more speedily attained. As a first indication of the consuming poison within, the glow of health fades from the cheek, and the rose gives place to the lily, the appetite is soon gone, digestion becomes bad, and a hectic¹⁰ flush and hacking cough, the precursors¹¹ of a hasty consumption, point too surely to an early grave.

15. Some persons have small taper waists from birth; but, as it is against the general law of Nature, and an indication of a frail and sickly body, it may justly be considered a deformity. Such, indeed, it was regarded by the ancient Greeks,

whose model of female beauty, the Venus de Medicis,¹² still the acknowledged standard among the refined and intelligent of all nations, presents, in the fully developed waist, that perfect *natural* symmetry of the human form which alone is consistent with the healthy action of the organs of life.

16. The defect of a waist unhealthily small may generally be remedied, and a healthy form attained, by a judicious exercise of the lungs, by walking in the open air, reading aloud, singing, sitting erect, and fully inflating¹³ the lungs at each inspiration.¹⁴ If the exercise be properly managed and persevered in, it will expand the chest and give tone and health to the lungs; but if it be ill-timed or carried to excess, it will be productive of injury.

17. We would say to all, then, who desire health and beauty—for the latter can never be attained without the former—*take care of your lungs*, and give them all that freedom of action and pure air which nature demands for them. Do not think you can violate with impunity the laws which a wise and just Providence has established for your well-being. “Let *His* work be preserved in its simplicity and perfection, and let not the whims of folly or the caprice of fashion, by distorting the shape, attempt to make improvements on the masterpiece of the Almighty.”*

1 IN-HĀL'ED, drawn into the lungs.

2 ĈĤĤĤ'-IC-AL, pertaining to chemistry; a more intimate union than can be obtained by mere *mixing*.

3 ĈOM-BŪS'-TION, burning; the action of fire in consuming a body.

4 STŪ'-POR, inaction; dullness.

5 VĤN'-TI-LĀ-TED, exposed to the action of wind or pure air.

6 DE-LĤR'-I-OUS, insane; frantic.

7 MŌR'-TAL, violent; deadly.

8 AP-O-PLĤS'-TIC, arising from *apoplexy*; a stopping of the functions of the brain.

9 ĈON-VŪL'-SIONS, spasms; involuntary contortions of the muscles.

10 HĤC'-TIC, arising from fever.

11 PRE-ĈŪR'-SOR, a forerunner; that which indicates the approach of an event.

12 MED'-I-CIS.

13 IN-FLĀT'-ING, puffing out with air.

14 IN-SPI-RĀ'-TION, the act of drawing air into the lungs.

* Deformity of the spine may be caused or increased by wrong positions either in sitting or in sleeping. If the body be placed in a perfectly horizontal position during sleep, all pressure will be removed from the cartilage cushions between the vertebrae of the spine, and thus, for seven or eight hours out of the twenty-four, they will be enabled gradually to return to their natural form. It is found by measurement that, in this way, the spine is every night *lengthened*—the cartilages recovering, by their elasticity, a slight increase of thickness. Thus every person is a little taller in the morning than at night.

But when a person sleeps with a high pillow, so that the spine is bent through the night, this relieving process, is not allowed to certain portions of the spinal column. Where delicacy of constitution particularly affects the back, the spine becomes more or less distorted by this position. This shows why children should not be allowed high pillows, and why they should be taught to sleep on both sides, if there is any danger of their bolstering up their heads too high.

LESSON XVI.

THE SKIN.—ITS COMPLICATED MECHANISM.

1. THE skin is a very curious piece of mechanism,¹ and it performs many wonderful and important offices. The more we study it, the more we shall find in it to surprise us; the more to admire in the wisdom which planned it; and the more fully we shall be convinced that the preservation of health depends as much upon the proper care we take of it, as of the organs within the body.

2. The skin is not merely a thin covering for the body, just to keep it warm, or to protect the parts from injury. It is something more than this. When we examine it we find that it is really very complicated² in structure, and we begin to wonder what can be the object of so curious a piece of machinery.

3. First, all over the surface of the body is a very thin and transparent layer, called the *cuticle*,³ or scarf-skin. It is, at first, a thin fluid that is poured out from the blood-vessels of the skin, and which, spreading over the true skin, becomes hardened into a thin layer. It is constantly forming, and constantly passing away. It has neither nerves nor blood-vessels, and is therefore without feeling. It is like the outer or rough bark of trees. On the under side of the cuticle is a thin colored layer, that gives color to the complexion.

4. Below the cuticle is what is called the true skin; and this is full of, 1st, arteries and veins, or capillary blood-vessels; 2d, nerves; 3d, lymphatic vessels; 4th, oil-tubes; and, 5th, perspiratory tubes. Let us see if we can understand something of the number, arrangement, plan, and uses of these vessels; for we may be assured this complicated mechanism was not made in vain.

THE CAPILLARIES OF THE SKIN.—5. The arteries, bringing the blood from the heart, branch out all over the skin in a net-work of minute fibres; and in this net-work, so fine that the eye can not trace all its parts, the veins begin, and, gathering up the blood, carry it back to the heart again. This net-

Fig. 15.



work connecting the arteries and veins, spread all through the true skin like the smallest imaginable hairs interlacing and crossing each other in every direction, is a part of what is called the *capillary* system. The drawing here given, showing an artery carrying the blood to the capillaries, and a vein taking it back to the heart, is a magnified view of what, in reality, is not so large as a pin-head.

6. But these capillary blood-vessels are not only spread over the skin, but also over and through every muscle, and bone, and nerve, and to every part of the body that requires nourishment. By the blood coming from the arteries every part is thus nourished; and by the veins the waste particles are carried away to be thrown out of the system. So numerous are these capillary vessels in the skin, that if the skin be punctured⁴ by the finest needle, some of them will be broken by it.

NERVES OF THE SKIN.—7. All the veins, and arteries, and capillaries, are so covered with a net-work of nerves, that no part of the skin can be punctured without piercing a nerve, and causing pain. But, although the skin is the organ of touch, and every where capable of exciting feeling, yet the nerves, by which we feel, do not come quite to the surface. They are all covered by the outer layer, or *cuticle*, which we have described.

8. When the cuticle is taken off, the true skin is found to be covered with little erect cones, called *pa-pil'læ*, which, however, can scarcely be seen by the naked eye. Each one of these *pa-pil'læ* penetrates *nearly* through the cuticle; and each one, although so small that we can scarcely see it, contains a loop of blood-vessels and a twig of a nerve; and these

Fig. 16.



Fig. 16 shows some of the *pa-pil'læ* from the palm of the hand, greatly magnified. They are about the one hundredth part of an inch in height; but it would take 250 of them, placed side by side, to make an inch in diameter.

The *pa-pil'læ* are numerous wherever the sense of touch is very acute—that is, wherever they are most needed, as at the ends of the fingers, and the tip of the tongue. They are numerous in the tip of the snout of the mole, at the end of the elephant's trunk, and at the root of the whiskers, or *feelers*, of the cat.

nerves enable us to *feel* any thing that we touch. These little *pa-pil'-læ*, filled with nerves, are like sentinels every where on duty, and they instantly send news to the brain when a part has been injured. In the tender and delicate parts of the system, which require the most care and protection, like the eye and the lungs, they are the most numerous. If a particle of dust lodges on the eyeball, how quickly do the nerves in the *pa-pil'-læ* send notice to the brain, that it may be removed! (See Fig. 16.)

LYMPHATICS.—9. In addition to the capillary blood-vessels and the nerves, the skin contains a system of tubular⁵ vessels called *lym-phat'-ics*, or absorbents, which are so small that they can not be seen by the naked eye. The lymphatics open outwardly on the under surface of the cuticle or scarf-skin, while inwardly they open into the veins. Is it possible that these little vessels are of any use? Yes; and it is very *certain* that they have not been made in vain.

10. There is one thing, at least, which they are able to do. The mouths, or outward openings of the absorbents, are so exposed that substances placed upon the skin are taken up by them, carried along their little tubes, and emptied into the veins, whence they are carried to that great working engine, the heart, and then sent all over the system. It is very evident that if the substances thus *absorbed* by the lymphatics are good and useful to the system, they may benefit the whole body; but, if they are bad, they may do it a great amount of injury.

11. If the arm should be dipped in poison, what, probably, would be the result? The lymphatics would doubtless absorb the poison, and empty it into the veins, and the veins would carry it to the heart, and the heart would carry it to every part of the body, to every muscle, and bone, and sinew, and nerve, poisoning all; and *death* might be the result. Such cases have often happened.

12. The writer of this knew a person who, having washed a number of sheep in a decoction⁶ of tobacco to kill the vermin on them, was so poisoned by the juice of the tobacco that was taken up by the lymphatics of the hands and arms, and carried into the blood, that he was made sick, and con-

fined to his bed for three months. In another case, several children in a family were actually killed by putting on their hands and arms a poisonous ointment by mistake. It is by the lymphatics that the poison from the bite of a mad dog, or a serpent, is carried into the system.

13. Physicians sometimes make use of the lymphatics to a very good purpose. In the process of vaccination,⁷ by which multitudes of lives are saved annually, a small particle of matter, placed under the outer skin, and being soon absorbed, affects the whole system, and protects it from the ravages of that terrible disease, the small-pox. Sometimes, when the stomach rejects a medicine, physicians give it by binding a quantity on the arm, after first removing the outer skin by a blister. It is also stated that persons have been fed through the skin, and kept alive for a long time by the absorption of nutritious substances.*

OIL-TUBES.—14. We have also said that the skin is full of *oil-tubes*. These draw oil from the blood, and spread it over the outer skin to keep the latter moist. In some parts of the body they are very abundant. Their little openings may be seen along the edges of the eyelids. The oil which they pour out there keeps the tears and moisture of the eyes within the lids, and also prevents that adhesion⁸ of the lids which occurs upon slight inflammation. These oil-tubes are also abundant on the head, where they supply the hair with a pomatum⁹ of Nature's own preparing.

¹ MĚCH'-AN-ISM, machine work; the parts of a machine.

² CŎM'-PLI-CĀ-TED, intricate; composed of many parts united.

³ ĆŮ'-TI-CLE, the outer or scarf skin.

⁴ PŮNC'-TŮRED, pierced.

⁵ TŮ'-BU-LAR, having the form of a tube.

⁶ DE-CŎC'-TION, the liquor in which any thing has been boiled or steeped.

⁷ VAC-CIN-Ā'-TION, the act of inoculating, or applying the vaccine matter to the skin.

⁸ AD-HĚ'-SION, sticking together.

⁹ PO-MĀ'-TUM, a perfumed ointment.

* "A person who has abstained from water will, after he has immersed his body in a bath, not only find his weight increased, but the sensation of thirst abated."—DRAPER.

LESSON XVII.

GROWTH AND DECAY—LIFE AND DEATH.

1. The most curious part of the skin is the numerous and minute PERSPIRATION-TUBES which it contains. These tubes open on the cuticle, and the openings are called *pores* of the skin. They descend into the true skin, where they form a coil, as seen in the drawing below. Small as are these tubes, they are lined on their inner surface with branches of the minute capillary blood-vessels, which we have described, and which are filled with the impure venous blood that is on its way back to the heart and lungs.

2. But what can be the object of all this complicated arrangement? Why are these little perspiration-tubes, as they are called, scattered thick all over the body—so thick, indeed, that *thirty-five hundred* of their little mouths have been counted on one square inch of the hand? What office have *they* to perform that is not performed by the capillaries, or the nerves, or the lymphatics, or the oil-tubes? Does there seem to be any necessity for them? Let us see.

Fig. 17 is a representation of one of the *perspiration-tubes*, or *su-dor-ip'-a-rous glands*, from the palm of the hand. The space from *d* to *b* represents a greatly magnified view of the thickness of the skin. The upper portion is the cuticle, the dark portion the colored layer, and the lower portion the true skin. The coil at the bottom, *a*, is imbedded in the surrounding fat, *c, c*. The tube opens on the surface of the skin, in a slight depression of the cuticle, at *d*.

Fig. 18 is a greatly magnified view of the surface of the skin of the palm of the hand. The dark lines are the furrows; the lighter portions are the ridges, in which are seen the dark circular openings of the perspiration-tubes. Beneath these ridges are also the points of the *pa-pil-læ*, which we have described.

Fig. 17.



Fig. 18.



3. We have seen that the arterial blood-vessels carry nourishment from the heart to all parts of the system, and that, after the blood has performed this part of its duty, it gathers up, in the minute capillaries, the waste and worn-out particles of the body, for the purpose of throwing them away. Most of the refuse particles, which consist of carbon, uniting in the capillaries with the oxygen which the blood received on its passage through the lungs, and forming, by this union, carbonic acid gas, are carried to the lungs, and there separated from the blood, and breathed out into the air through the mouth and nostrils, in the form of carbonic acid gas and vapor.

4. But the perspiration-tubes also are all the time busy in performing the same kind of labor as the lungs, in purifying the blood. As these tubes, opening into the air, are lined with the capillary blood-vessels, the air which they contain is brought in close contact with the blood, just as the air is brought in close contact with the blood in the lungs; and waste and worn-out particles of the body, in the form of water, soda, potash, iron, oil, salts, and acids, and carbonic acid gas, are poured out into the perspiration-tubes, and by them carried to the surface of the body, and thrown out through the pores of the skin.

5. These numerous tubes are therefore constantly performing the process which we call *perspiration*. When we *sweat* freely they are very active, and perform a vast amount of labor. Each one of these tubes is about a quarter of an inch in length, including its coils; *seventy-three feet* of this tubing in one square inch of the skin, or *twenty-eight miles* of it spread over the body of a common sized man!

6. A wonderful apparatus,¹ indeed! but not more wonderful than the amount and importance of the labor which it performs; for it is calculated that these little tubes carry off daily, through the skin of a full-grown active man, not less than two or three pounds of waste matter! These little workers are all the time engaged in this labor; and the blood from the arteries is just as busy in supplying the vacant places with new material! Thus physiologists tell me that my body—this house which I live in—is constantly being pulled down

and undergoing repairs, and that there is not a particle of it which is the same now that it was ten years ago!

7. Thus we are dying every hour, nay, every instant; and the only difference between this death and that which occurs at the end of life (so far as regards the body) is, that in this gradual death the place of every dead particle is instantly supplied by a living one, while in the other case all the parts of the body perish together, and are not reproduced. In youth the building up process goes on more actively than the pulling down process; in middle life the two powers are equal; but in old age the pulling down process gains the ascendancy,² and the house we live in gradually falls to decay.

8. How strange it seems that ten years ago you had one body, and that now you have another! You can, indeed, see, hear, and taste as you could before; but the eye with which you see is not the same as the one you had ten years ago: it is a new eye; and you hear with a different ear, and taste with another tongue. Indeed, the eye of to-day is not the same as that of yesterday; for a part of the eye of yesterday has passed away, while the deficiency thus produced has been supplied by a part of yesterday's dinner! But the *mind*—the thinking power or principle of yesterday and of ten years ago—that is within you still. Through all the changes and the *many* deaths of the body, the mind—the *SOUL*—still lives.

9. "The purple stream that through my vessels glides,
Dull and unconscious flows like common tides;
The pipes through which the circling juices stray,
Are not that thinking I, no more than they:
This frame compacted,³ with transcendent⁴ skill,
Of moving joints obedient to my will,
Nursed from the glebe,⁵ like yonder tree
Waxes and wastes;⁶ I call it *mine*¹, not *me*':
New matter still the mouldering⁷ mass sustains,
The mansion changed, the tenant still remains;
And from the fleeting stream, repaired by food,
Distinct as is the swimmer from the flood."

ARBUTHNOT.

¹ AP-PA-RĀ'-TUS, a complete set of instruments for performing any operation.

² AS-CĒND'-EN-CY, controlling influence; superiority.

³ COM-PACT'-ED, constructed; made dense and firm.

⁴ TRANS-CĒND'-ENT, very excellent.

⁵ GLĒBE, soil; land.

⁶ "WAXES AND WASTES," grows and decays.

⁷ MŌULD'-ER-ING, decaying.

LESSON XVIII.

ABUSES OF THE SKIN.

1. BUT what if those busy workers, the perspiration-tubes of which we have spoken, should stop laboring for only one day? What if they should refuse to do the work which has been assigned to them? Would any injury be done? Yes, a vast amount of injury. The waste particles of matter, when they are not permitted to escape through the pores of the skin, clog up the system, and irritate and poison it, so as to produce inflammation or fever. Only think of two or three pounds of waste and poisonous matter, that ought to be thrown away, collecting in the body in so short a time, merely because these little tubes are unable to do their work! If the difficulty should continue several days, and no remedy be found, not only disease, but death itself would be the result.

2. These perspiration-tubes are sometimes closed when a person takes a severe cold; for the cold, after deadening their action, contracts them, and closes the little pores which open on the skin. And now see how nature tries to remedy the evil. As the waste matter can not escape through these openings, it remains in the veins, but it clogs the current of the blood, and makes it a dark and filthy stream. This stream, with all its impurities, soon finds its way to the heart, and the heart sends it to the lungs to be cleansed.

3. But now the lungs have more work to do than usual, and, after toiling awhile with all their might to remove the impurities of the blood, they become weary; they themselves become clogged with the waste matter which they have separated from the blood; they make a vain effort, by coughing, to remove it, and then a fever sets in. There is now a fever all over the skin, and a fever in the lungs also, and all because the little pores of the skin stopped work for a while. The lungs did all they could to remove the evil, but the additional labor imposed upon them soon made them sick also.

4. We can scarcely imagine the amount of suffering caused by the closing up of these little pores—these millions of little

breathing holes that are scattered all over the body. Closing them is like closing the mouth and nostrils, and shutting out the air we breathe. It is vastly important, then, that we should know what dangers we are liable to from this source, and how we may avoid them.

5. A healthy action of the skin will be found to depend upon proper attention to clothing, cleanliness, exercise, light, and air. The importance of *pure air* is seen in the fact that the functions¹ of the skin in purifying the blood are similar to those of the lungs. *Light* is as essential to an animal as to a plant. Plants that grow in the shade are never so strong and vigorous, nor have they so dark and brilliant colors, as those that grow in the sunshine; and a child that grows up in a dark cellar, or any dark room, will always have a pale and unhealthy countenance.

6. Although the skin requires a suitable degree of warmth, of which each person must be the judge in his own case, yet that kind of clothing should be used which is best adapted to protect the body from the effects of sudden changes of temperature.² For this purpose woolen and cotton garments, fitting loosely, are to be preferred to linen, as the latter absorbs and retains moisture, and thereby rapidly conducts the heat from the body.

7. Any clothing of close texture³ that excludes air from the body, and thereby prevents the perspiration from passing off freely, is injurious; for if the poisonous matter be left in contact with the skin, it will be likely to be absorbed into the system by the lymphatics. Cover the body with varnish, so as to close the pores of the skin, and a feeling of suffocation will immediately be felt, a fever will set in, and the individual will soon die. India-rubber clothing that excludes the air will always produce injurious effects. The advantages of frequent ablutions⁴ of the whole body, and of frequent changes of clothing, arise from the importance not only of keeping the pores of the skin open and in healthy action, but also of preventing the absorption of the poisonous matter which has once been excluded by them.

8. But exercise in pure air is no less essential to the health of the skin than to other portions of the body. The capil-

laries of the skin depend for their vigorous action upon bodily exercise; the warmth of the skin, and the resistance which it offers to sudden changes of temperature, also depend upon that rapid waste and repair of the system, of which exercise is the immediate cause. And, finally, as a summary⁵ of all that may be said upon the subject of bodily health, its fundamental⁶ rules may be embraced in three words—TEMPERANCE, CLEANLINESS, and EXERCISE.

¹ FŪNġ'-TIONS, offices; duties; employments.

² TĒM'-PER-A-TŪRE (*tem'-per-a-tyure*), state of the air with regard to heat or cold.

³ TĒXT-ŪRE (*tekst'-yur*), the arrangement or disposition of the threads woven together.

⁴ AB-LŪ'-TIONS, washings.

⁵ SŪM'-MA-RY, a brief or abridged statement of a fuller account.

⁶ FŪN-DA-MĒNT'-AL, most important; serving for the foundation.

LESSON XIX.

THE YEARS OF MAN'S LIFE.

1. THE first *seven* years of life—man's break of day—
Gleams of short sense, a dawn of thought display;
When *fourteen* springs have bloomed his downy cheek,
His soft and bashful meanings learn to speak.
2. From *twenty-one* proud manhood takes its date,
Yet is not strength complete till *twenty-eight*;
Thence to his five-and-thirtieth, life's gay fire
Sparkles and burns intense in fierce desire.
3. At *forty-two* his eyes grave wisdom wear,
And the dark future dims him o'er with care;
With *forty-nine* behold his toils increase,
And busy hopes and fears disturb his peace.
4. At *fifty-six* cool reason reigns entire;
Then life burns steady, and with temperate fire;
But *sixty-three* unbends the body's strength,
Ere the unwearied mind has run her length;
And when, at *seventy*, age looks her last,
Tir'd she stops short, and wishes all were past.

LESSON XX.

HEALTH.—A LETTER TO MOTHERS.

MRS. SIGOURNEY.

1. MOTHERS', is there any thing we can do to acquire for our daughters a good constitution'? Is there truth in the sentiment sometimes repeated, that our sex is becoming more and more effeminate'?¹ Are we as capable of enduring hardship as our grandmothers were'? Are we as well versed in the details of housekeeping', as able to bear them without fatigue', as our mothers were'? Have our daughters as much stamina² of constitution', as much aptitude³ for domestic duties as we ourselves possess'? These questions are not interesting to us simply as individuals. They affect the welfare of the community. For the ability or inability of woman to discharge what the Almighty has committed to her, touches the equilibrium⁴ of society, and the hidden springs of existence.

2. Outlines of the mysterious mechanism of our clay-temple we ought certainly to study, that we need not, through ignorance, interfere with those laws on which its organization⁵ depends. Rendered precious by being the shrine⁶ of an undying spirit, our ministrations⁷ for its welfare assume an almost fearful importance. Appointed, as the mother is, to guard the harmony of its architecture, to study the arts on which its symmetry depends, she is forced to perceive how much the mind is affected by the circumstances of its lodgment, and is incited to cherish the mortal for the sake of the immortal.

3. Does she attach value to the gems of intellect'? Let her see that the casket which contains them be not lightly endangered or carelessly broken'. Does she pray for the welfare of the soul'? Let her seek the good of its companion, who walks with it to the gate of the grave, and rushes again to its embrace on the morning of the resurrection'.

4. Fashion seems long enough to have attacked health in its strong-holds. She can not even prove that she has ren-

dered the form more graceful, as some equivalent for her ravages. In ancient Greece, to which our painters and sculptors still look for the purest models, was not the form left untutored?⁸ the volume of the lungs allowed free play? the heart permitted, without manacles, to do the great work which the Creator assigned it?

5. Let us educate a race who shall have room to breathe. Let us promise, even in their cradle, that their hearts shall not be pinioned as in a vice, nor their spines bent like a bow, nor their ribs forced into the liver. Doubtless the husbands and fathers of the next generation will give us thanks.

6. Yet, if we would engage in so formidable a work, we must not wait until morbid habits have gathered strength. Our labor must be among the elements of character. We must teach in the nursery that "the body is the temple of the Holy Ghost." We must leave no place in the minds of our little ones for the lunatic⁹ sentiment, that the mind's healthful action, and the integrity¹⁰ of the organs on which it operates, are secondary to the vanities of external decoration. If they have received from their Creator a sound mind and a sound body, convince them that they are accountable for both. If they deliberately permit injury to either, how shall they answer for it before their Judge?

7. *And how shall the mother answer it*, in whose hand the soul of her child was laid, as a waxen tablet, if she suffer Fashion to cover it with fantastic¹¹ images, and Folly to puff out her feverish breath, melting the lines that Wisdom penciled there, till what Heaven would fain have polished for itself, loses the fair impression, and becomes like common earth?

1 EF-FĒM'-IN-ATE, weak; tender; delicate; unhealthy.

2 STĀM'-I-NA, strength; solidity.

3 ĀPT'-I-TŪDE, fitness; suitableness.

4 E-QUI-LĪB'-RI-UM, a just balancing; due regulation.

6 OR-GAN-I-ZĀ'-TION, proper arrangement of all its parts.

3 SHRĪNE, abode; temple; case or box in which any thing sacred is kept.

7 MIN-IS-TRĀ'-TIONS, our services or efforts as subordinate agents.

8 UN-TŪ'-TOR-ED, to grow naturally; untaught.

9 LŪ'-NA-TIC, crazy; insane.

10 IN-TĒG'-RI-TY, soundness; healthful action.

11 FAN-TĀS'-TIC, foolishly odd; uncouth; unnatural.

LESSON XXI.

REST AND SLEEP.

HODGKIN.

1. WE have noticed the effect of exercise upon the muscular system; and we have seen that it is essential to the growth and healthy action of the body. We have seen that a period of rest is necessary for a fatigued muscle to recover itself; and we have also found that if the rest be too long continued, the muscle will be enfeebled thereby.

2. But *rest* has to be considered not merely with reference to its power of restoring the energies¹ of the muscular system; it has an important influence on digestion, and also on the strength and activity of the mind. Moreover, the proper and economical employment of that most invaluable possession, *time*, depends very much upon the due limitation² and arrangement of our hours of repose.

3. There are, properly speaking, but two degrees of repose. The one is that in which all bodily exercise is wholly, or to a great degree, suspended; while the mind still retains its consciousness,³ but is not employed on any subject calculated to fatigue or disturb it. The other, well known by the name of sleep, is that in which not only bodily exercise is suspended, but the operations of the mind also are stopped. Even dreams are an imperfection in sleep, and show that mental repose is not complete.

4. Although rest and sleep—the two degrees of repose to which we have alluded—give relief to the exhausted system, they are far from being precisely similar in their effects, nor can one be indifferently substituted for the other. Every one must be aware that when the body and mind are exhausted by long-continued wakefulness and exertion, a short period of sleep has a much greater restorative⁴ effect than complete tranquillity of body and mind without it. Who has not felt the force of the poet's expression,

“Nature's sweet restorer—balmy sleep.”

5. On the other hand, there are times when rest is neces-

sary, but when sleep is undesirable. The first part of the process of digestion does not go on so well during sleep as when the body is in a state of wakeful repose; and the mind, provided it has not been exhausted by long-continued application, is better fitted for some occupations after wakeful relaxation⁵ than after sleep.

6. What portion of time, and what part of the day should be devoted to sleep, are subjects of considerable importance; yet it will not answer to lay down a definite rule for all persons. Some individuals are so very active in their habits and dispositions, that a comparatively small portion of sleep is not only all which they require, but all which they can take; while others can give way to it at any time.

7. Both of these extremes are undesirable; but they may, happily, be very much corrected by careful attention to the formation of habit. Those who possess extreme activity of mind or body, and greatly curtail the rest required by both, can not fail seriously to injure their health. If they do not bring on some disease under which their exhausted frames sink after a short struggle, they become almost inevitably the victims of premature old age, decrepitude,⁶ and death.

8. On the other hand, those who give way to slothfulness,⁷ and devote an inordinate⁸ time to rest and sleep, have their energies destroyed; their bodies become flabby, bloated, and easily fatigued; and their minds, even in their most wakeful moments, are torpid, indisposed for continued attention to any subject, and unfit for close application. Such persons may be said to waste life in a threefold manner. First, all the time consumed in rest and sleep, beyond what the body and mind require, is lost; a second portion is lost in the diminished value of their waking hours; and, thirdly, the term of their life is likely to be shortened by the injury which their health sustains.

9. There is considerable difference in the amount of sleep required at different ages. Children, who have little power and much activity, are the soonest fatigued, and require the most rest. In old age there is generally the smallest necessity for sleep; yet exceptions to this are seen in the decrepitude of extreme old age, and in cases in which, in conse-

quence of disease, there is great tendency to sleep. In the prime of life, when the system is capable of making the greatest exertions, a medium portion of rest is required to restore the body, after exhaustion by fatigue; but even at this period of life, the differences depending on constitution and habit are very considerable.

10. From six to seven hours may be regarded as the average amount of time which those engaged in the ordinary concerns of life, and reasonably exercising both body and mind, may devote to rest in bed. Some persons have been able to do with from four to five hours; but in most of these cases the mind was kept in a state of excitement by a succession of momentous⁹ or intensely interesting subjects; hence instances of this kind are met with among severe students, military commanders, and persons engaged in political affairs. Health is generally injured and life shortened by a continuance of this habit. There are very few cases, excepting among persons with impaired health, in which the limit of six or seven hours need be exceeded.

11. The following distribution of time has been prescribed by some superior individuals who were well acquainted with its value. Lord Chief Justice Coke, of England, laid down a rule for himself in the following couplet:

“Six hours in sleep; in law’s grave study six;
Four spend in prayer; the rest on Nature fix.”

This rule was somewhat modified by that excellent man and accomplished scholar, Sir William Jones:

“Six hours to law; to soothing slumber seven;
Ten to the world allot—and *all* to Heaven.”

¹ EN'-ER-GIES, internal strength and activity.

² LIM-IT-Ā'-TION, restriction; the act of limiting.

³ CŌN'-SCIOUS-NESS, knowledge of what passes in one's own mind.

⁴ RE-STŌR'-A-TIVE, power to renew strength and vigor.

⁵ RE-LAX-Ā'-TION, a loosening or slackening of the energies.

⁶ DE-CRĒP'-IT-ŪDE, that broken and infirm state of the body produced by old age.

⁷ SLŌTH'-FUL-NESS, the habit of idleness; inactivity.

⁸ IN-ŌR-DIN-ATE, excessive; immoderate.

⁹ MO-MĒNT'-OUS, highly important.

LESSON XXII.

EARLY RISING.

1. WHATEVER may be the quantity of sleep required, early rising is essential to health, and promotes longevity.¹ Almost all men who have distinguished themselves in science, literature, and the arts, have been early risers. The industrious, the active-minded, the enthusiasts² in pursuit of knowledge or gain, are up betimes at their respective occupations, while the sluggard wastes the most beautiful period of his life in pernicious slumber.

2. Homer, Virgil, and Horace are all represented as early risers: the same was the case with Paley, Priestley, and Buffon; the last of whom ordered his servant to awaken him every morning, and compel him to get up by force if he evinced any reluctance; for which service he was rewarded with a crown each day, which recompense he forfeited if he did not oblige his master to get out of bed before the clock struck six.

3. Bishops Jewel and Burnet rose every morning at four o'clock. Sir Thomas More did the same thing. Napoleon was an early riser; so were Frederick the Great, Charles the Twelfth, and Washington. Sir Walter Scott, during the greater part of his life, rose by five o'clock; and his literary work was accomplished chiefly before breakfast. Franklin and nearly all the great men of the American Revolution were early risers; so were Daniel Webster and John Quincy Adams. That early rising tends to prolong life appears to be clearly proved. One of the most eminent judges of England—Lord Mansfield—was at the pains of collecting some curious evidence on this subject. When he presided in his judicial capacity over the court, he questioned every old person who appeared at the bar respecting his habits; and all agreed on one point—that of being early risers.—*Anonymous*.

4. "Falsely luxurious,³ will not man awake,
And, springing from the bed of sloth, enjoy
The cool, the fragrant, and the silent hour,

To meditation dūe and sacred song?—

Wildered⁴ and tossing through distempered dreams,

Who would in such a gloomy state remain

Longer than nature craves, when every Muse

And every blooming pleasure wait without,

To bless the wildly-devious⁵ morning walk?" THOMSON.

5 "Rise with the lark and with the lark to bed.

Give to repose the solemn hour she claims;

And from the forehead of the morning steal

The sweet occasion.

6. "O! there is a charm

That morning has, that gives the brow of age

A smack of youth, and makes the lip of youth

Breathe perfumes exquisite. Expect it not,

Ye who till noon upon a down-bed lie,

Indulging feverish sleep; or, wakeful, dream

Of happiness no mortal heart has felt,

But in the regions of romance'.

7. "Ye fair,

Like you it must be wooed, or never won;

And, being lost, it is in vain ye ask

For milk of roses and Olympian dew.

Cosmetic⁶ art no tincture can afford

The faded features to restore: no chain,

Be it of gold, and strong as adamant,

Can fetter beauty to the fair one's will." HURDIS.

¹ LON-ĒĒV'-I-TY, long life.

² EN-THŪ'-SLASTS, persons of ardent zeal.

³ JUX-Ū'-TI-ŌUS, indulging to excess in the gratification of any appetite.

⁴ WIL'-DER-ED, puzzled; losing one's way.

⁵ DE'-VI-ŌUS, rambling; roving.

⁶ COS-MET'-IC, promoting beauty; a wash to improve beauty.

LESSON XXIII.

THE OLD COTTAGE CLOCK.

CHARLES SWAIN.

1. O, THE old, old clock, of the household stock,¹

Was the brightest thing and neatest; \

The hands', though old', had a touch² of gold', \

And its chime³ rang still the sweetest', \

'Twas a monitor,⁴ too, though its words were few', \

Yet they lived, though nations altered'; \

And its voice, still strong, warned old and young'.

When the voice of friendship faltered'.⁵

"Tick, tick," it said—"quick, quick, to bed";
 For ten I've given warning';
 Up, up, and go, or else, you know',
 You'll never rise soon in the morning'."

2. A friendly voice was that old, old clock',
 As it stood in the corner smiling,
 And blessed the time with a merry chime,
 The wintry hours beguiling';⁶
 But a cross old voice was that tiresome clock
 As it called at daybreak boldly',
 When the dawn looked gray o'er the misty way,
 And the early air blew coldly':
 "Tick, tick," it said—"quick, out of bed;
 For five I've given warning';
 You'll never have health, you'll never get wealth,
 Unless you're up soon in the morning."

¹ "HOUSEHOLD STOCK," household goods or furniture. ⁴ MÖN'-I-TOR, one who gives warning or advice.

² TOUCH, appearance (shining like gold).

³ CHIME, the sound made by striking.

⁵ FAL'-TER-ED, failed; hesitated.

⁶ BE-GUİL'-ING, causing to pass pleasantly.

LESSON XXIV.

HEALTH PROVERBS.

A HAPPY heart makes a blooming visage.
 A good life keeps off wrinkles.
 A penny-worth of mirth is worth a pound of sorrow.
 A merry heart doeth good like a medicine.—SOLOMON.
 If we subdue not our passions, they will subdue us.
 Passion is a fever that leaves us weaker than it finds us.
 Where reason rules, appetite obeys.
 He that wants health wants every thing.
 Sickness is felt, but health not at all.
 Diseases are the interest paid for pleasure.
 The follies of youth are food for repentance in old age.
 Eat little at dinner, and less at supper.
 After dinner sit a while, after supper walk a mile.
 He that riseth early may walk, but he that riseth late must
 trot all day.

PART II.
SECOND DIVISION OF ZOOLOGY;
CONTINUED FROM THE THIRD READER, AND HERE EMBRACING
ORNITHOLOGY,
OR THE NATURAL HISTORY OF BIRDS.



LESSON I.

BIRDS.

1. BIRDS are prominently distinguished from the mammalia¹ by their general form and feathery covering, and by producing their young from eggs. In form and structure² they are wisely adapted to the element³ in which they move.

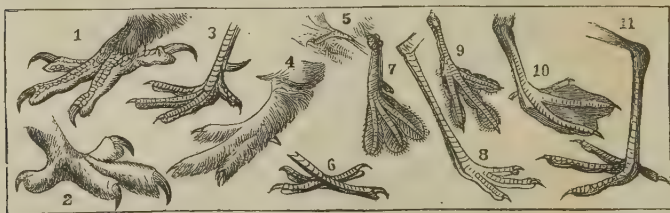
2. The heads of most birds are pointed, so as easily to cleave the air; the body expands gently, and has wings which serve as movable weights to balance it, and as oars to propel⁴ it forward; and it diminishes by a spreading tail that helps to

keep it buoyant,⁵ and, at the same time, serves as a rudder to direct its course.

3. The great bones of the limbs, and many of those of the body, are hollow receptacles⁶ of air, communicating with the lungs. In various parts of the body are also bladder-like cavities⁷ which can be swollen out with warm air, so as to give the bird additional size, and enable it to float in its native element with greater ease. The quills and feathers, by their peculiar form and structure, unite the greatest possible degrees of lightness and strength.

4. Birds are divided into orders; and the divisions are made according to the various modes in which the birds are to gain their subsistence. Thus birds of prey, like the carnivorous⁸ mammalia, are distinguished by their size, strength, and remarkable length of sight. The other orders of land birds, and also the two divisions of water birds, are all equally well adapted to the various modes of life marked out for them by the great Creator.

5. This principle of adaptation—of means designed for some particular end—is seen especially in the feet, or claws, and beaks of birds. In how marked a manner do the powerful talons⁹ of the eagles, hawks, and owls, differ from the tiny feet of the perching swallow and the wren; and the long, stilt-like legs of the ostrich, designed for running, from the webbed feet of the swimming ducks, geese, and pelicans.

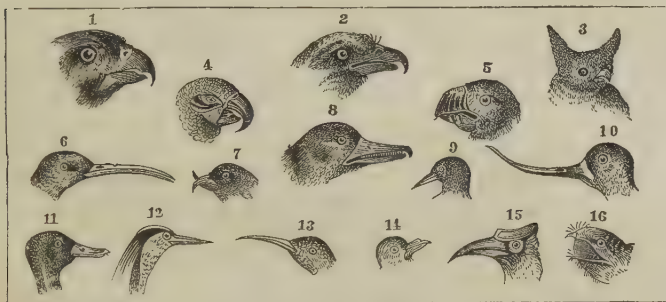


Feet of Birds. See Note.

6. The beaks of birds differ perhaps still more widely. In birds of prey the beak is like a carving or dissecting knife;

FEET OF BIRDS.—1. Claw of Golden Eagle. 2. Eagle Owl. 3. Poultry bird. 4. Rock Ptarmigan. 5. Perching bird. 6. Climbing bird, Woodpecker. 7. Grebe. 8. Plover. 9. Phalarope. 10. Duck. 11. Ibis.

in the woodpeckers it is an effective chisel; in the snipe, the curlew, and the humming-birds, it is a long and slender probe; in the parrots it is a climbing hook or a fruit-knife; in the swallows it is a kind of fly-trap; in the swans, geese, and ducks, it is a flattened strainer; in the storks and herons it is like a fish-spear; in the seed-eating birds it forms a pair of seed-crackers for removing the kernel from the husk which covers it.



Heads of Birds. See Note.

7. And how peculiar are those instincts of birds which teach them to build their nests, each after the fashion pursued from time immemorial by its own particular species! While the untamed eagle builds its nest of a mass of sticks rudely thrown together on some inaccessible cliff, while the condor of the Andes has no nest but the bare and lofty rock, and the ostrich of the torrid zone often "leaves her eggs in the earth, and warmeth them in the sand," other birds build nests of most elaborate¹⁰ pattern and exquisite¹¹ workmanship.

8. "Some to the holly-hedge
Nestling repair, and to the thicket some;
Some to the rude protection of the thorn
Commit their feeble offspring; the cleft tree
Offers its kind concealment to a few,
Their food its insects, and its moss their nests.
Others apart, far in the grassy dale,
Or rough'n'ing waste, their humble texture weave."—THOMSON.

HEADS OF BIRDS. — 1. Falcon. 2. Eagle. 3. Owl. 4. Parrot. 5. Puffin. 6. Curlew. 7. Crossbill. 8. Merganser Duck. 9. Woodpecker. 10. Plover. 11. Duck. 12. Crane. 13. Humming-bird. 14. Petrel. 15. Hornbill. 16. Whip-poor-will.



Nests of Birds. See Note.

9.

"It wins my admiration

To view the structure of that little work—
 A bird's nest. Mark it well, within, without;
 No tool had he that wrought; no knife to cut;
 No nail to fix; no bodkin to insert;
 No glue to join; his little beak was all;
 And yet how neatly finish'd! What nice hand,
 With every implement and means of art,
 And twenty years' apprenticeship to boot,
 Could make me such another?"—HURDIS.

10. The migrations¹² of birds furnish us another subject which shows forth the abundant wisdom that pervades the whole economy¹³ of nature. Most of our summer birds leave us at the approach of winter to seek food and shelter hundreds and sometimes thousands of miles away, in sunnier climes. Who taught them thus to know the changing seasons? What hand guides and gives strength of wing to sustain them in their homeward flight? How natural that their departure from us in the closing season of the year should remind us to prepare for *our* departure ere the winter of death closes over us.

11.

"Ye gentle birds, that perch aloof,
 And smooth your pinions¹⁴ on my roof,

NESTS OF BIRDS.—1. Cliff Swallows. 2. Sociable Weaver Birds, having entrances below, and numerous nests within. 3. Bar-tailed Humming Bird; nest of downy materials, often woven together with spiders' webs. 4. Republican Grosbeaks, or Weaver Birds; the general cover, built by the united labors of the birds, sometimes shelters hundreds of nests. 5. Chestnut-crowned Titmouse. 6. Nest of Tailor Bird, formed by stitching leaves together. 7. Pendulous Titmouse. 8. Wren. 9. Baltimore Oriole. 10. Wood Swallow. 11. Weaver Finches; suspended over water, with entrance from beneath.

Preparing for departure hence,
 Now Winter's angry threats commence ;
 Like you, my soul would smooth her plume
 For longer flights beyond the tomb.

12. "May God, by whom is seen and heard
 Departing men and wandering bird,
 In mercy mark us for his own,
 And guide us to the land unknown!"—W. HAYLEY.

13. The dress or plumage of birds is not only admirable for its fitness to the ends for which it was designed—for its softness, smoothness, compactness, and lightness—but also for the most brilliant coloring which is lavished upon so many of the "winged denizens¹⁵ of the air." This is more especially true of birds of the torrid zone, whose glowing colors, rivaling the hues of the rainbow, mock the efforts of the artist to depict¹⁶ them in their gorgeous richness and beauty.

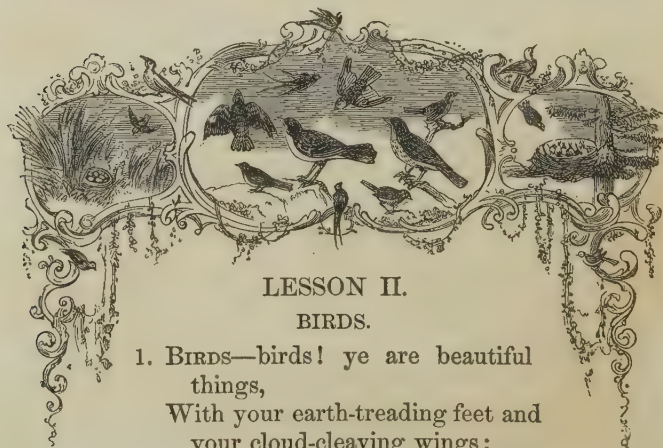
14. But it is the singing of birds—the melody of the "songsters of the grove"—and the grace of their motions, not less than their beautiful plumage, which have thrown such a charm around these "creatures of freedom and light," as ever to have made them favorite subjects of poetry and song. The study of the forms, history, and habits of birds, abundantly illustrated as all these subjects have been by the genius of the poet and the painter, can not fail to be both interesting and instructive to every lover of Nature; and its happy tendency must be to lead the mind "from Nature up to Nature's God."

15. The first and most plainly-marked division of birds is into two large groups, Land Birds and Water Birds. Of the former there are five great divisions or orders, which are designated as, 1st, *Birds of Prey*; 2d, *Perchers*, or sparrow-like birds; 3d, *Climbers*, such as the parrots, woodpeckers, and cuckoos; 4th, *Scratchers*, or poultry birds; and, 5th, *Runners*, which embrace the ostriches. Of the Water Birds there are two great divisions or orders, designated by the names Waders and Swimmers.

16. These divisions into orders take their rise chiefly from marked differences in the feet or claws of birds, some of which have already been noticed. Each of these orders is farther di-

vided into families—the external marks on which these divisions are founded being chiefly differences in the forms of the bills. Thus some families are known as the cleft-bills, some as toothed-bills, some as cone-bills, and others as thin-bills. The whole number of different species of birds described has been estimated at about six thousand.

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|--|--|
| 1 MAM-MĀ'-LI-A, animals that suckle their young. See Third Reader. | 8 ĆĀR-NĪV'-O-ROUS, flesh-eating. |
| 2 STRŪĖT'-ŪRE, arrangement of parts. | 9 TĀL'-ON, the whole foot of a bird of prey. |
| 3 ĖL'-E-MENT, natural dwelling-place, as the air. | 10 E-LĀB'-O-RATE, studied with great care. |
| 4 PRO-PĒL', move. | 11 ĖX'-QUIS-ITE, very nice; exact. |
| 5 BUŌY'-ANT, light; floating. | 12 MĪ-GRĀ'-TION, removal from one climate or country to another. |
| 6 RE-ĖP'-TA-CLE, a place in which something is contained. | 13 E-ĖŌN'-O-MY, arrangement; plan. |
| 7 ĆĀV'-I-TIES, hollow places. | 14 PĪN'-IONS, feathers; wings. |
| | 15 DĒN'-I-ZENS, inhabitants. |
| | 16 DE-PIĖT', to paint. |



LESSON II.

BIRDS.

1. BIRDS—birds! ye are beautiful things,
With your earth-treading feet and
your cloud-cleaving wings;
Where shall man wander, and where shall he dwell,
Beautiful birds, that ye come not as well?
2. Ye have nests on the mountain all rugged and stark,¹
Ye have nests in the forest all tangled and dark:
Ye build and ye brood² 'neath the cottagers' eaves,
And ye sleep on the sod 'mid the bonnie³ green leaves;
Ye hide in the heather, ye lurk in the brake,
Ye dive in the sweet-flags that shadow the lake:

Ye skim where the stream parts the orchard-decked land,
Ye dance where the foam sweeps the desolate strand.

3. Beautiful birds! ye come thickly around
When the bud's on the branch and the snow's on the
ground;

Ye come when the richest of roses flush out,
And ye come when the yellow leaf eddies⁴ about.

4. Beautiful birds! how the school-boy remembers
The warblers that chorused⁵ his holiday tune;
The robin that chirped in the frosty December,
The blackbird that whistled through flower-crowned
June:

The school-boy remembers his holiday ramble,
When he pulled every blossom of palm he could see,
When his finger was raised as he stopped in the bramble
With "Hark! there's the cuckoo; how near he must
be!"

5. Beautiful creatures of freedom and light!
Oh! where is the eye that groweth not bright
As it watches you trimming your soft glossy coats,
Swelling your bosoms, and ruffling your throats?
Oh! I would not ask, as the old ditties⁶ sing,
To be "happy as sand-boy," or "happy as king;"
For the joy is more blissful that bids me declare,
"I'm as happy as all the wild birds of the air."
6. I will tell them to find me a grave when I die,
Where no marble will shut out the glorious sky;
Let them give me a tomb where the daisy will bloom,
Where the moon will shine down, and the leveret⁷ pass by;
But be sure there's a tree stretching out far and wide,
Where the linnet, the thrush, and the woodlark may hide;
For the truest and purest of requiems⁸ heard
Is the eloquent hymn of the beautiful bird.

ELIZA COOK.

¹ STĀRK, lone; still; barren.

² BEGOD, sit on and cover their eggs in their nests.

³ BŌN'-MIE (or *bon'-ny*), gay; cheerful.

⁴ ED'-DINT, moves circularly when falling to the ground.

⁵ CHŌ'-RUSEN, sung in chorus or concert.

⁶ DĪT'-TIES, little poems to be sung.

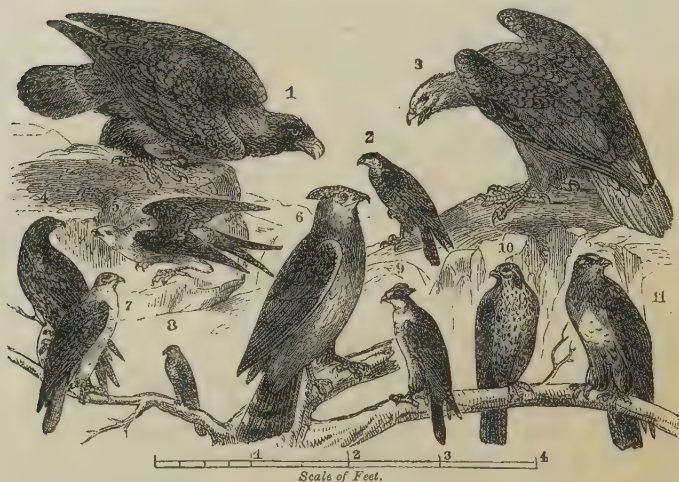
⁷ LĒV'-EE-ET, a hare in the first year of her age.

⁸ RE'-QVI-EM, a hymn sung for the dead.

I. BIRDS OF PREY.

LESSON III.

THE FALCON TRIBE.



1. Golden Eagle, *Aquila chrysaeta*. 2. Peregrine Falcon, *Falco peregrinus*. 3. Bald Eagle, *Haliaeetus leucocephalus*. 4. Common Kite, *Falco milvus*. 5. Swallow-tailed Hawk, *Falco furcatus*. 6. Mexican Harpy Eagle, *Thrasaetus harpyia*. 7. Ger-falcon, *Falco gyrfalco*. 8. Sparrow Hawk, *Falco nisus*. 9. South American Crested Hawk, *Spizaetus cristatellus*. 10. Goshawk, *Falco palumbarius*. 11. Osprey, *Falco haliaetus*.

1. THE first order of birds consists of the birds of prey, which embrace three families, known as, 1st, the FALCONS, which include the eagles, kites, buzzards, and hawks; 2d, the VULTURES; and, 3d, the OWLS. All of the falcon tribe, except two or three of the larger eagles, are generally known by the common name of hawks. The birds of prey and the carnivorous quadrupeds are very much alike in general character, both being large and strong, of dispositions fierce and daring, and the whole frame adapted for swift pursuit or powerful action.

2. In treating of the falcon tribe the first place is given to the EAGLE, on account of its great size and strength, the

grandeur of its aspect, and the dignity of its movements. The golden eagle, which is about three feet in length, having a plumage of a deep and rich yellowish-brown, glossed on the back and wings with purple, is a truly magnificent bird, and has ever been associated with majesty or nobility. By the ancient Greeks and Romans he was called the "bird of Jove;" and by all rude and savage nations he is regarded as the appropriate emblem¹ of courage and independence.

3. The golden eagle is found throughout the whole circuit of the globe. The eyry² of this noble bird is generally the face of some stupendous inland cliff, with its nest on a projecting shelf, or on some dwarf tree that grows from the rock, generally in a situation difficult of access, and often out of the reach of shot either from below or from the top of the precipice.

4. The eagle, when in search of food, surveys the ground by soaring above it, often to an immense height; and when its rapid eye detects its prey, it rushes downward with the rapidity of an arrow, and seldom fails to seize the object at which it aims. In this manner hares, lambs, grouse, and sometimes the young of deer and foxes, are borne away to feed its young.

5. During our revolutionary war a golden eagle had placed her nest below one of the cliffs on the Hudson River. A soldier was let down by his companions, suspended by a rope round his body. When he reached the nest he suddenly found himself furiously assailed by the eagle. In self-defense he drew the only weapon about him, his knife, and made repeated thrusts at the bird, when accidentally he cut the rope nearly off. It began unraveling, when those above hastily drew him up, and relieved him from his perilous situation at the moment when he expected to be precipitated to the bottom; but so powerful was the effect of the fear he had experienced, that within three days his head became quite gray.

6. The white-headed, or bald eagle, as it is called, equaling in size the golden eagle, is the most common of the eagle tribe in this country, and the one adopted by us as our national emblem. It is not bald-headed, as its name indicates; but the appearance of the white feathers of the head, con-

trasting strongly with the dark color of the rest of the plumage, has given it the false name by which it is now generally known.

7. The flight of the bald eagle, when we consider the ardor and energy of his character, is noble and interesting. Sometimes the human eye can just discern him, like a minute speck, slowly moving in a large circle along the face of the heavens, as if reconnoitring³ the earth at that immense distance. Sometimes he glides along in a nearly horizontal line, at a great height, with expanded and scarcely moving wings, till he gradually disappears in the distant blue ether.⁴

8. At the great cataract of Niagara bald eagles were formerly seen in considerable numbers, and at all seasons of the year, attracted thither by the carcasses of animals that had been drawn into the current and precipitated over the falls. Their presence, as they would penetrate, seemingly in reckless daring, into the very midst of the spray that rose from the falling waters, gave additional sublimity to the scene.



9. "High o'er the watery uproar, silent seen,
Sailing sedate, in majesty serene,
Now midst the pillared spray sublimely lost,
And now, emerging, down the rapids tossed,
Glides the bald eagle, gazing, calm and slow,
O'er all the horrors of the scene below ;
Intent alone to sate⁵ himself with blood,
From the torn victims of the raging flood."

ALEX. WILSON.

10. The fish-hawk, or osprey, another bird of the eagle family, is found in considerable numbers in the northern United States from March to September, frequenting bays of the ocean, and inland ponds and streams which abound in fish. It is nearly two feet in length ; its bill is of a bluish black, the head mostly white, and the wings and back of a deep brown. It is a welcome bird to the fishermen on our coasts, who regard its arrival in spring as the harbinger⁶ of plenty.

11. A great length of wing and a forked tail are the principal characters which distinguish the KITES from the rest of the birds of prey. The most noted of this family are the common kite of Europe, and the swallow-tailed hawk, which

is found abundantly in the southern United States. The BZZARDS are distinguished by their expanded wings and squared tails. The best known of the buzzards in this country is the red-tailed buzzard, more commonly called the *hen-hawk*.

12. “The hawk, in mid-air high,
On his broad pinions sailing round and round,
With not a flutter, or but now and then,
As if his trembling balance to regain,
Utters a single scream, but faintly heard,
And all again is still.”—C. WILCOX.

13. Of the FALCONS proper, the peregrine falcon of Europe, known also as the “blue hawk” of Scotland, and as the “great-footed hawk” and “duck-hawk” of America, is the most noted. In the age of falconry it was greatly valued in Europe for sporting purposes. It is the terror of wild-fowl on our coasts, and the wonder of sportsmen, uncommonly bold and powerful, darting on its prey with astonishing velocity, and striking it to the earth or water before securing it.

14. When water-fowl perceive the approach of the peregrine falcon, a universal alarm pervades their ranks. If they are flying, they all speed to the water, and there remain till the enemy has passed them, diving the moment he comes near them. He is said often to follow the footsteps of the gunner, knowing that the ducks will be aroused on the wing, which will afford him a chance of almost certain success in taking his prey. The falcon is not only a universal plunderer, but he is bold and fearless also. He has been justly called “the Arab of the air.”

15. “The falcon is a noble bird ;
And when his heart of hearts is stirr'd,
He'll seek the eagle, though he run
Into his chamber near the sun.
Never was there brute or bird,
Whom the woods or mountains heard,
That could force a fear or care
From him—the *Arab of the air*.”—PROCTOR.

16. At one time the sport of falconry—the practice of taking wild-fowl by means of hawks trained to the purpose—was common in England. After having been long in disuse,

it has latterly been revived; and it is but a short time since the English papers teemed with accounts of a hawking party in England, in which dukes and duchesses joined in the sport.



Hawking.

17. That the peregrine falcon is not incapable of personal attachment to its keeper, the following anecdote will show. A favorite falcon had escaped from an English officer on his passage from England to Canada. Some time after, learning that an American captain at Halifax had in his possession a fine hawk which had made its appearance on board of his ship during his late passage from Liverpool, the officer set out for Halifax, with the hope of recovering his bird.

18. As the captain demanded proof of ownership, it was agreed that if the hawk, when brought into a room full of gentlemen, should recognize the officer, and manifest undoubted signs of attachment, he should be given up. No sooner was the hawk brought in by the captain than he darted from him, and, perching on the shoulder of the officer, rubbed his head against his cheek, played with the buttons of his coat, and by every means in his power evinced his delight and affection. The proof was entirely satisfactory, and the falcon was restored to its rightful owner.

19. Of the **HAWKS** proper, the goshawk, or peregrine hawk, is the largest and most powerful, being from twenty inches to two feet in length. This bird is now of rare occurrence in the United States, but is found widely extended in range throughout Europe and America. His flight is exceedingly rapid. At times he passes like a meteor through the woods, where he secures squirrels and hares with ease. At other times he will give chase to a flock of wild pigeons, forcing himself into the very centre of the flock, scattering them in confusion, and never failing to secure a bird in his talons.

20. Audubon describes one which he saw turning from a flock of pigeons to give chase to a large flock of crow blackbirds then crossing the Ohio River: "The hawk approached them with the swiftness of an arrow, when the blackbirds rushed together so closely that the flock looked like a dusky ball passing through the air. On reaching the mass, he, with the greatest ease, seized first one, then another, and another, giving each a squeeze with his talons, and suffering it to drop upon the water. In this manner he procured four or five before the poor birds reached the woods, into which they instantly plunged, when he gave up the chase, swept back over the water in graceful curves, and picked up the fruits of his industry, carrying each bird singly to the shore."

21. But the most common of American hawks is the *sparrow-hawk*, which is found in every district from Maine to Texas, and from the Atlantic to the Pacific. It is only about half the size of the goshawk. Beautifully erect, it may often be seen on the highest fence-stake, the broken top of a tree, the summit of a grain-stack, or the corner of the barn, patiently and silently waiting until it spy a mole, a field-mouse, a cricket, or a grasshopper, on which to pounce. The blue jays have a particular antipathy⁸ to the sparrow-hawk, often following it and mocking its notes; in return for which the insulted bird now and then contents himself with feeding on the plumpest of his persecutors.

¹ ĖM'-BLEM, representation.

² ĖY'-RY (*ă-'ry*), the place where birds of prey construct their nests.

³ RE-ON-NOR'-TRING, examining.

⁴ E'-THER, the sky.

⁵ SĀTE, to satisfy; to glut.

⁶ HĀR'-BIN-GER, sign: that which precedes and gives notice of something.

⁷ "TEEMED WITH," were full of.

⁸ AN-TĪP'-A-TĪV, hatred.

LESSON IV.



Eagle pursuing the Swan.

HABITS OF THE EAGLE.

1. To give you, kind reader, some idea of the nature of the noble bird whose figure is emblazoned¹ on our national standard, permit us to place you on the Mississippi, on which you may float gently along, while approaching winter brings millions of water-fowl on whistling wings, from the countries of the north, to seek a milder climate in which to sojourn for a season.

2. The eagle is seen perched, in an erect attitude, on the summit of the tallest tree by the margin of the broad stream. His glistening but stern eye looks over the vast expanse.² He listens attentively to every sound that comes to his quick ear from afar, glancing now and then on the earth beneath, lest even the light tread of the fawn may pass unheard. His mate is perched on the opposite side of the stream, and, should all be tranquil and silent, warns him by a cry to continue patient.

3. At this well known call the male partly opens his broad wings, inclines his body a little downward, and answers to her voice in tones not unlike the laugh of a maniac. The next moment he resumes his erect attitude, and again all around is silent. Ducks of many species are seen passing with great rapidity, and following the course of the current; but the eagle heeds them not: they are at that time beneath his attention.

4. The next moment, however, the wild trumpet-like sound of a yet distant but approaching swan is heard. A shriek from the female eagle comes across the stream, for she is fully as alert³ as her mate. The latter suddenly shakes the whole of his body, and with a few touches of his bill arranges his plumage. The snow-white swan is now in sight; her long neck is stretched forward; her eye is on the watch, vigilant as that of her enemy; her large wings seem with difficulty to support the weight of her body, although they flap incessantly. She approaches, however. The eagle has marked her for his prey. As the swan is passing the dreaded pair, the male bird, with an awful scream, starts from his perch in full preparation for the chase.

5. Now is the moment to witness a display of the eagle's powers. He glides through the air like a falling star, and, like a flash of lightning, comes upon the timorous quarry,⁴ which now, in agony and despair, seeks, by various manœuvres, to elude the grasp of his cruel talons. It mounts, doubles, and willingly would plunge into the stream, were it not prevented by the eagle, which, knowing that the swan would thus escape him, forces it to remain in the air by attempting to strike it with his talons from beneath.

6. The hope of escape is soon given up by the swan. It has already become much weakened, and its strength fails at the sight of the courage and swiftness of its antagonist. Its last gasp is about to escape, when the ferocious eagle strikes with his talons the under side of its wing, and, with unresisted power, forces the bird to fall in a slanting direction upon the land. There his mate joins him, when the royal pair turn the breast of the luckless swan upward, and gorge themselves with gore.

7. The eagle has great partiality for fish, and, in pursuing them, as he is not a fisher himself, he displays, in a very singular manner, the genius and energy of his character. Elevated on the high dead limb of some gigantic tree that commands a view of the neighboring shore and ocean, he seems calmly to contemplate the motions of the various feathered tribes that pursue their busy avocations⁵ below—the snow-white gulls, slowly winnowing the air; trains of ducks streaming over the surface; silent and watchful cranes, intent⁶ and wading; clamorous crows, and all the winged multitudes that subsist by the bounty of this vast liquid magazine of Nature.

8. High over all these hovers one whose action instantly arrests his whole attention. By his wide curvature of wing and sudden suspension in air, the eagle knows him to be the osprey, or fish-hawk, settling over some devoted victim of the deep. His eye kindles at the sight, and, balancing himself, with half-opened wings, he watches the result. Down, rapid as an arrow from heaven, descends the distant object of his attention, the roar of its wings reaching the ear as it disappears in the deep, making the surges foam around.

9. At this moment the eager looks of the eagle are all ardor; and, leveling his neck for flight, he sees the fish-hawk emerge, struggling with his prey, and mounting in the air with screams of exultation. These are the signal for our hero, who, launching into the air, instantly gives chase, and soon gains on the fish-hawk; each exerts his utmost to mount above the other, displaying in these manœuvres the most elegant and sublime aerial⁷ evolutions.⁸

10. The unencumbered eagle rapidly advances, and is just on the point of reaching his opponent, when, with a sudden scream, probably of despair and execration, the latter drops his fish; the eagle, poising himself for a moment, as if to take a more certain aim, descends like a whirlwind, snatches it in his grasp ere it reaches the water, and bears his ill-gotten booty silently away to the woods.

AUDUBON AND WILSON.

1 EM-BLĀ'-ZONED, adorned with figures; set out pompously.

2 EX-PĀNSE', extent of space.

3 A-LĒET', watchful; vigilant.

4 QU. R'-RY, the game.

5 AV-O-CĀ'-TION, business; employment.

6 IN-TĒNT', ardent; eager.

7 Ā-E'-RI-AL, pertaining to the air; lofty.

8 EV-O-LŪ'-TIONs, movements.

LESSON V.



THE OSPREY, OR SEA EAGLE.

1. SOON as the sun, great ruler of the year,
 Bends to our northern climes his bright career,
 And from the caves of ocean calls from sleep
 The finny shoals¹ and myriads² of the deep;
 When freezing tempests back to Greenland ride,
 And day and night the equal hours divide;
 True to the season, o'er our sea-beat shore,
 The sailing osprey high is seen to soar,
 With broad, unmoving wing. Now, circling slow,
 He marks³ each straggler⁴ in the deep below;
 Sweeps down like lightning! plunges with a roar!
 And bears his struggling victim to the shore.

ALEX. WILSON.

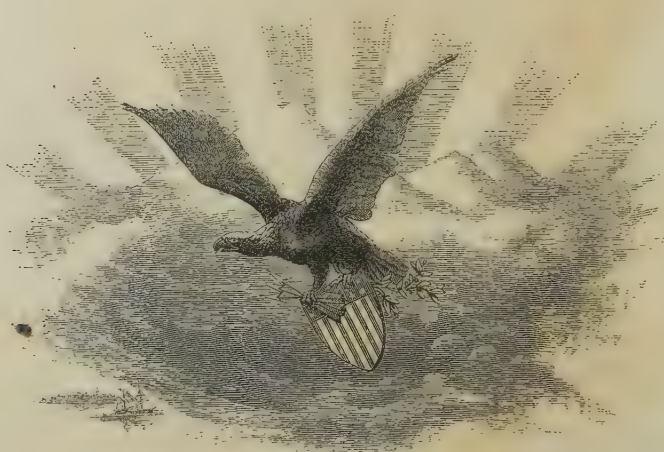
2. Most awful is thy deep and heavy boom,⁵
 Gray watcher of the waters! Thou art king

Of the blue lake ; and all the winged kind
 Do fear the echo of thine angry cry.
 How bright thy savage eye ! Thou lookest down,
 And seest the shining fishes as they glide ;
 And, poising⁶ thy gray wing, thy glossy beak
 Swift as an arrow strikes its roving prey.
 Ofttimes I see thee, through the curling mist,
 Dart, like a spectre⁷ of the night, and hear
 Thy strange, bewitching call, like the wild scream
 Of one whose life is perishing in the sea.

M'LELLAN.

¹ SHŌAL, a crowd ; a throng.² MYR'-I-AD, an immense number.³ MARKS, sees ; notices.⁴ STRÄG'-GLER, a wanderer.⁵ BOOM, a hollow roar as of waves.⁶ POIS'-ING, balancing.⁷ SPĚC'-TRE, a ghost ; the appearance of a dead person.

LESSON VI.



THE AMERICAN EAGLE.

1. BIRD of the heavens ! whose matchless eye
 Alone can front the blaze of day,
 And, wandering through the radiant¹ sky,
 Ne'er from the sunlight turns away ;

Whose ample wing was made to rise
 Majestic o'er the loftiest peak,
 On whose chill tops the winter skies,
 Around thy nest, in tempests speak—

2. What ranger of the winds can dare,
 Proud mountain king! with thee compare?
 Or lift his gaudier² plumes on high
 Before thy native majesty,
 When thou hast taken thy seat alone,
 Upon thy cloud-encircled throne?
3. Bird of the sun! to thee—to thee
 The earliest tints of dawn are known,
 And 'tis thy proud delight to see
 The monarch mount his gorgeous throne;
 Throwing the crimson drapery by,
 That half impedes his glorious way;
 And mounting up the radiant sky,
 E'en what he is—the king of day!
4. Bird of Columbia! well art thou
 An emblem of our native land;
 With unblenched³ front and noble brow,
 Among the nations doomed to stand,
 Proud, like her mighty mountain woods;
 Like her own rivers, wandering free;
 And sending forth, from hills and floods,
 The joyous shout of liberty!
5. Like thee, majestic bird! like thee
 She stands in unbought majesty,
 With spreading wings, untired and strong,
 That dares a soaring far and long,
 That mounts aloft, nor looks below,
 And will not quail⁴ though tempests blow.

C. W. THOMPSON.

¹ RA'-DI-ANT, beaming with brightness.

² GAU'-DI-ER, more showy.

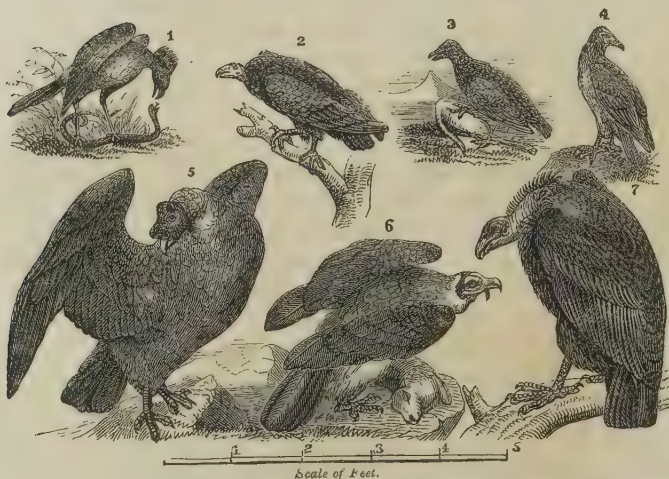
³ UN-BLENCHED', unstained; unshrinking

⁴ QUAIL, shrink back.

BIRDS OF PREY—*Continued.*

LESSON VII.

VULTURES AND OWLS.



1. Secretary Vulture, *Gypogeryon serpentarius*. 2. Turkey Buzzard, *Cathartes aura*. 3. Carrion Crow, *Cathartes atratus*. 4. Egyptian Vulture, *Neophron percnopterus*. 5. Condor, *Sarcorampus gryphus*. 6. Bearded Vulture, *Gypætus barbatus*. 7. California Vulture, *Cathartes Californianus*.

1. THE VULTURES are, on the whole, considerably larger than the falcon birds, but they are much less courageous. Most of them, unlike the falcons, feed on putrid flesh; and they are generally protected by the natives of the countries which they inhabit, on account of their utility¹ in disposing of decayed animal remains.

2. The beak of these birds is long and curved, but not notched; and the talons, not being required to tear living animals, are comparatively weak; but in order that the parts of the bird which come in contact with its offensive food may not become soiled or matted, most of the head is naked; and the legs, at the lowest parts, are covered with scales, and not

with feathers as in the eagle. The wings are strong and large, and the general plumage uncommonly thick and coarse.

3. Among the vultures of the western continent may be mentioned the condor of South America, which is five feet in length, and the expanse of its wings fourteen; the California vulture, but little less in size than the condor; the well known turkey buzzard of our southern states; and also the black vulture, or carrion crow of the south, which is found in the streets of cities, where it is protected, being regarded as a kind of scavenger² whose labors are subservient³ to the public good.

4. The Egyptian vulture, sometimes called Pharaoh's chicken, is abundant in Spain and on the opposite African shores. The secretary vulture, found in Southern Africa, is a very curious-looking bird, which feeds exclusively upon reptiles and serpents. The bearded vulture, or vulture of the Alps, which approaches the character of the falcons in frequently seizing live animals for its prey, is about four feet in length, and the largest bird of Europe.

“Among the barren Alpine cliffs the bearded vulture dwells,
Who never fattens on the prey which from afar he smells;
But, patient, watching hour on hour, upon a lofty rock,
He singles out some truant lamb, a victim, from the flock.”



1. Virginia Horned Owl, *Bubo Virginianus*. 2. Little Screech Owl, *Bubo Asio*. 3. Great Horned Owl, or Eagle Owl, *Bubo maximus*. 4. Great Snowy Owl, *Surnia nyctea*. 5. Hawk Owl, or Barn Owl, *Strix Americana*.

5. The OWLS, which also belong to the birds of prey, are a

very numerous family, and some of them are found in all quarters of the globe. They feed on birds, small quadrupeds, and insects, and some species on fish. Those most common in this country are the barred owl, which is about eighteen inches in length; the little sparrow owl; the great northern white owl, or snowy owl; the white or barn owl; and the Virginia horned owl. The latter, found in almost every part of the United States, is the one whose mournful *hoo, hoo, hoo-e* is so often heard in the night season. The eagle owl inhabits the great forests of Europe.

6. The owls are mostly nocturnal⁴ in their habits, remaining concealed by daylight, and coming forth at night in pursuit of their prey. Their abodes are usually deep forests, old ruins, and hollow trees; and this circumstance, connected with the grotesque⁵ appearance of their shaggy heads and large round eyes, their noiseless flight, the dismal hootings of some, and frightful screechings of others, as heard in the silence and gloom of night, have caused them to be regarded, by the ignorant of all countries, with a kind of superstitious⁶ dread. The poets have indulged freely in this general prejudice; and in their descriptions of midnight storms and gloomy scenes of nature, the owl is generally introduced to heighten the horror of the picture.

7. "In the hollow tree, in the old gray tower,
The spectral owl doth dwell;
Dull, hated, despised in the sunshine hour,
But at dusk he's abroad and well!
Not a bird of the forest e'er mates with him—
All mock him outright, by day;
But at night, when the woods grow still and dim,
The boldest will shrink away!

"So, when the night falls, and the dogs do howl,
Sing ho! for the reign of the horned owl!
We know not always
Who are kings by day,
But the king of the night is the bold brown owl!"

BARRY CORNWALL.

¹ Ū-TĪL'-I-TY, usefulness.

² ScĀV'-EN-GEE, one who cleans the streets of a city.

³ SUB-SĒEV'-I-ENT, conducive.

⁴ NOC-TŪR'-NAL, pertaining to the night.

⁵ GRO-TĒSQUE', oddly formed; uncouth.

⁶ SU-PER-STĪ'-TIOUS, full of idle fancies in religious matters.

LESSON VIII.



SONG OF THE OWL.

1. Tu whit! tu whoo!—in my ancient hall,
 In my old gray turret¹ high,
 Where the moss is thick on the crumbling wall,
 A king—a king reign I!
 — Tu whoo!
 I wake the wood with my startling call
 To the frightened passers-by.

2. The ivy-vines in the chink that grow,
 Come clambering up to me;
 And the newt,² the bat, and the toad, I trow,³
 A right merry band are we.
 Tu whoo!
 Oh, the confined monks⁴ in their cells below
 Have no goodlier company,

3. Let them joy in their brilliant sunlit skies,
 And their sunset hues, who may;
 But softer by far than the tints they prize,
 Is the dim of the twilight gray!

Tu whoo!

Oh, a weary thing to an owl's eyes
 Is the garish⁵ blaze of day.

4. When the sweet dew sleeps in the midnight cool,
 Some tall tree top I win;
 And the toad leaps up on her throne-shaped stool,
 And our revels loud begin—

Tu whoo!

While the bullfrog croaks o'er his stagnant pool,
 Or plunges sportive in.

5. As the last lone ray from the hamlet⁶ fades
 In the dark and still profound,
 The night-bird sings in the cloister⁷ shades,
 And the glow-worm lights the ground—

Tu whoo!

And fairies trip o'er the broad green glades,⁸
 To the firefly circling round.

6. Tu whit! tu whoo! All the livelong night
 A right gladsome life lead we;
 While the starry ones from their azure height
 Look down approvingly.

Tu whoo!

They may bask⁹ who will in the noonday light,
 But the midnight dark for me.

MRS. HEWITT.

¹ TŪR'-RET, a little tower; a spire rising from a building.

² NEWT, a small lizard.

³ TRŌW, think; believe.

⁴ MŌNK, one who retires from the world, and devotes himself to religion.

⁵ GĀR'-ISH (or *gair'-ish*), dazzling; gaudy.

⁶ HĀM'-LET, small village.

⁷ CLOIS'-TER, a house inhabited by monks or nuns.

⁸ GLĀDES, open places in forests.

⁹ BĀSK, to lie in warmth; be at ease.

II. PERCHING OR SINGING BIRDS.

“If thou art pained with the world’s noisy stir,
 Or crazed with its mad tumults, and weighed down
 With any of the ills of human life’;
 If thou art sick and weak, or mourn’st the loss
 Of brethren gone to that far distant land
 To which we all do pass, gentle and poor,
 The gayest and the gravest, all alike’;
 Then turn into the peaceful woods and hear
 The thrilling music of the forest birds.”—M^YLELLAN.

LESSON IX.

THE TOOTHED-BILLS (*DENTIROSTRES*).

1. African Fly-catcher, *Muscicapa rufiventris*. 2. Mocking-bird, *Turdus polyglottus*. 3. Kingbird, or Tyrant Fly-catcher, *Muscicapa tyrannus*. 4. White Plumed African Shrike, *Lanius plumatus*. 5. American Shrike, *Lanius borealis*. 6. Cedar-bird, *Ampelis Americana*. 7. Greenlet, or Green Wren, *Muscicapa cantatrix*. 8. Robin, *Turdus migratorius*. 9. Wood-thrush, *Turdus melodus*.

1. THE second order of birds consists of the PERCHERS, or sparrow-like birds, sometimes also called *Singing Birds*, because it embraces nearly all those which have musical notes.

These birds are of smaller size than those of the other orders, and they nearly equal the numbers of all the others.

2. As the name PERCHERS indicates, the power of grasping the twigs of trees and of perching¹ upon them is a prominent feature in the birds of this order. The habitual residence of most of them is in the woods or thickets; all have the powers of flight in full perfection; and the larger part feed upon insects, or the seeds of vegetables, which they procure by the beak alone.

3. The perching birds may be divided into the following four tribes or subdivisions, founded on the varying form of the beak: the toothed-bills, the cleft-bills, the cone-shaped-bills, and the slender or thin-bills. As some of the toothed-bills seize and feed upon small living animals, they properly come next in order to the birds of prey.

4. The toothed-bills are so named because they have the upper mandible² notched on each side near the tip, like the bills of the falcons. The principal birds included in this division are the shrikes, or butcher-birds; the thrushes; the large family of the warblers, or singing forest birds; the chat-terers; and the fly-catchers. About fifty species of the warblers alone, among which are included the bluebird, yellow-bird, tailor-bird, the wagtails, and a host of other summer birds, are found on the American continent.

5. Among the butcher-birds, the great American shrike, which is about ten inches in length, is entitled to no common degree of respect, as his courage and intrepidity are beyond every other bird of his size, the kingbird alone excepted. In defense of his young he attacks the largest hawks or eagles with a resolution truly astonishing, so that all of them respect him, and on all occasions decline the contest. The shrike has a curious habit of catching grasshoppers and small birds, and sticking them on a thorn or sharp stick before eating them.

6. The thrushes, which are of a great variety of colors, are common in all parts of the world, and many of them are eminently birds of song. The wood-thrush of America, which is a sweet but solitary songster; the mavis, or song-thrush of Europe; the English blackbird, the American robin, the Amer-

ican mocking-bird, and the English nightingale, all belong to this family.

7. "With the sweet airs of spring the robin comes;
And in her simple song there seems to gush
A strain of sorrow when she visiteth
Her last year's withered nest. But when the gloom
Of the deep twilight falls, she takes her perch³
Upon the red-stemmed hazel's slender twig,
That overhangs the brook, and suits her song
To the slow rivulet's inconstant chime."⁴—M'LELLAN.

8. The American mocking-bird, which is nine and a half inches in length, having the upper parts of the head and body of a dark gray, tinged with brown, and the lower parts brownish-white, is unrivaled for his great variety of song; and by his great powers of imitation he is superior to any bird that possesses its native notes alone.

9. "He often deceives the sportsman, and sends him in search of birds that perhaps are not within miles of him, but whose notes he exactly imitates; even birds are frequently imposed upon by this admirable mimic, and are decoyed by the fancied calls of their mates, or they dive with precipitation⁵ into the depths of thickets at the scream of what they suppose to be the sparrow-hawk.

10. "In confinement he loses little of the power and energy of his song. He whistles for the dog; Cæsar starts up, wags his tail, and runs to meet his master. He squeaks out like a hurt chicken, and the hen hurries about with hanging wings and bristled feathers, clucking to protect her injured brood. He repeats the tune taught him by his master, though of considerable length, fully and faithfully. He runs over the quiverings of the canary,⁶ and the clear whistlings of the Virginia nightingale, or redbird, with such superior execution and effect that the mortified birds feel their own inferiority, and become altogether silent; while he seems to triumph in their defeat by redoubling his exertions."

11. Among the chatterers, or wax-wings, the cedar wax-wing, or cedar-bird, is the principal one known to us. Of the more numerous family of the fly-catchers, the kingbird, the phebe-bird, the redstart, and the greenlets, which are gener-

ally called "fly-catchers," are common in this country; but the geographic range of the true broad-billed fly-catchers is almost confined to tropical regions, where insects, which constitute their principal, if not their only food, are the most abundant.

¹ PĒRCH'-ING, sitting like a bird.

² MĀN'-DI-BLE, applied to the lower jaw of the mammalia, to both jaws of birds, and to the upper pair of jaws in insects.

³ PĒRCH, any thing on which birds light.

⁴ CHĪME, murmur; musical harmony.

⁵ PRE-CĪP-I-TĀ'-TION, headlong haste.

⁶ CA-NĀ'-RY, a bird from the Canary Isles.

LESSON X.



THE MOCKING-BIRD.

1. **EARLY** on a pleasant day
 In the poet's month of May,
 Field and forest looked so fair,
 So refreshing was the air,
 That, in spite of morning dew,
 Forth I walked where tangling grew
 Many a thorn and breezy bush;
 When the redbreast and the thrush
 Gayly raised their early lay,
 Thankful for returning day.

2. Every thicket, bush, and tree
Swelled the grateful harmony:
As it mildly swept along,
Echo seemed to catch the song;
But the plain was wide and clear
Echo never whispered near.
From a neighboring mocking-bird
Came the answering notes I heard
3. Soft and low the song began:
I scarcely caught it as it ran
Through the melancholy trill
Of the plaintive whippoorwill,
Through the ringdove's gentle wail—
Chattering jay and whistling quail,
Sparrow's twitter, catbird's cry,
Redbird's whistle, robin's sigh,
Blackbird, bluebird, swallow, lark,
Each his native note might mark.
4. Oft he tried the lesson o'er,
Each time louder than before.
Burst at length the finished song;
Loud and clear it poured along;
All the choir in silence heard.
Hushed before this wondrous bird,
All transported and amazed,
Scarcely breathing, long I gazed.
5. Now it reached the loudest swell;
Lower, lower, now it fell,
Lower, lower, lower still;
Scarce it sounded o'er the rill.
Now the warbler ceased to sing;
Then he spread his russet wing,
And I saw him take his flight
Other regions to delight.

J. R. DRAKE.

LESSON XI.

THE BLUEBIRD (*Sialia Wilsoni*).

1. THE bluebird, which is found in great numbers in the Southern States during winter, visits the north in early spring, frequently while the snow is on the ground; and so fond is he of his old haunts,¹ that even in mid-winter, after a few days of mild weather, he reappears

among us, enlivening even a day of sunshine by his cheerful presence.

2. His fondness for his mate, and solicitude² to please her, have often been noticed and admired. Says a curious and correct observer: "He uses the tenderest expressions, sits close by her, and sings to her his most endearing warblings. When seated together, if he espies an insect delicious to her taste, he takes it up, flies with it to her, spreads his wing over her, and puts it into her mouth. If a rival makes his appearance, he attacks and pursues the intruder as he shifts³ from place to place, in tones that bespeak⁴ the jealousy of his affection; conducts him, with many reproofs, beyond the extremities of his territory, and returns to warble out his transports of triumph beside his beloved mate."

3. The summer song of the bluebird is a soft, agreeable warble, usually accompanied with a gentle quivering of the wings; but when the cold blasts of autumn threaten the approach of winter, it changes to a single plaintive note, like a sigh at leaving the endeared objects of his northern home. No wonder that the society of the bluebird is courted by the inhabitants of the country, and that the farmers are so willing to provide for it, in some suitable place, a snug little summer-house, ready fitted, and rent free. For this he more than sufficiently repays them by the cheerfulness of his song, and the multitude of injurious insects which he daily destroys.

4. "When winter's cold tempests and snows are no more,
 Green meadows and brown furrow'd fields reappearing,
 The fishermen hauling their nets to the shore,
 And cloud-cleaving geese to the north are all steering ;
 When first the low butterfly flits on the wing,
 When red glow the maples, so fresh and so pleasing,
 O then comes the bluebird, the herald of spring!
 And hails, with his warblings, the charms of the season.
5. "He flits through the orchard, he visits each tree,
 The red flowering peach, and the apple's sweet blossoms,
 The fruit-bearing products, wherever they be,
 And seizes the caitiffs⁵ that lurk in their bosoms ;
 He drags the vile grub from the corn it devours,
 The worms from their beds where they riot and welter ;⁶
 His song and his services freely are ours,
 And all that he asks is, in summer, a shelter.
6. "But when the gay scenes of the summer are o'er,
 And autumn slow enters, so silent and fallow,⁷
 And millions of warblers that charm'd us before,
 Have fled in the train of the sun-seeking swallow,
 The bluebird, forsaken, yet true to his home,
 Still lingers and looks for a milder to-morrow,
 Till, forced by the rigors of winter to roam,
 He sings his adieu in a lone note of sorrow.
7. "While spring's lovely season, serene, dewy, warm,
 The green face of earth, and the pure blue of heaven,
 Or love's native music, have power to charm,
 Or sympathy's glow to our feelings is given,
 Still dear to each bosom the bluebird shall be ;
 His voice, like the thrillings of hope, is a treasure ;
 For, through bleakest storms, if a calm he but see,
 He comes to remind us of sunshine and pleasure."

ALEX. WILSON.

8. In his motions and general character the bluebird has great resemblance to the robin redbreast of Britain, and had he the brown olive of that bird, instead of his own blue, he could hardly be distinguished from him. Like him he is known to almost every child, and shows as much confidence in man by associating with him in summer, as the other by his familiarity in winter.

¹ HĀUNTS (like *a in far*), place of resort.² SO-LĪ'-OI-TŪDE, anxiety.³ SHĪFTS, moves.⁴ BE-SPEĀK', show ; indicate.⁵ ČĀĪ'-TĪFF, a captive ; a rascal.⁶ WĒL'-TER, to roll or wallow.⁷ SĀL'-LŌW, having a yellow color, like the color of the leaves in autumn.

PERCHING BIRDS—*Continued.*

LESSON XII.

THE CLEFT-BILLS (*FISSIROSTRES*).

1. Night-hawk, *Caprimulgus Americanus*. 2. Green Tody, *Todus viridis*. 3. Barn-swallow, *Hirundo rustica*. 4. Kingfisher, *Alcedo alcyon*. 5. Trogon, *Trogon pavoninus*. 6. African Blue-headed Bee-eater, *Merops ceruleo-cephalus*. 7. Royal Great-crest, *Todus regius*.

1. THIS division of the perching birds is readily distinguished from all others by the beak, which is short, but broad, and very deeply cleft,¹ so that the opening of the mouth is extremely wide. The principal home of these birds is in tropical countries. Some species are found in the temperate zone during the warm season of the year, but on the approach of winter they depart to more congenial² climes. They have been divided into the following six families: Night-jars, or Night-hawks, Bee-eaters, Swallows, Todies, Trogons, and Kingfishers.

2. Among the *night-jars* are included the common goat-sucker of Europe, our common night-hawk, whippoorwill, and chuck-wills-widow, and also a South American night-

hawk, known as the guacharo.³ All these birds are nocturnal in their habits, like the owls; their voices are often harsh and strange, and that of the chuck-wills-widow is seldom heard in cloudy weather, and never when it rains.

3. The male of the common night-hawk is frequently seen toward evening mounting in the air by several quick movements of the wings, then a few slower, uttering all the while a sharp, harsh squeak, till, having gained the highest point, he suddenly dives head foremost, and with great rapidity, down sixty or eighty feet, wheeling up again as suddenly, and making at the same time a loud booming⁴ sound, which is probably caused by his suddenly opening his capacious mouth as he passes rapidly through the air.*

4. "And, in mid air, the sportive *night-hawk*, seen
 Flying a while at random, uttering oft
 A cheerful cry, attended with a shake
 Of level pinions⁵ dark; but, when upturn'd
 Against the brightness of the western sky,
 One white plume shining in the midst of each;
 Then far down diving with a hollow sound."—C. WILCOX.

5. The whippoorwill, which greatly resembles the night-hawk, is a bird found only in America, and is noted for its peculiar song, which seems very plainly to articulate⁶ the syllables which compose its name. This bird is first heard in our Northern States about the beginning of May, generally at dusk, and through the evening. Toward midnight it generally becomes silent, but its notes burst forth again at early dawn, and continue till the beams of the rising sun scatter the darkness that overhung the face of Nature.

6. "Lone whippoorwill,
 There is much sweetness in thy fitful⁷ hymn,
 Heard in the drowsy watches⁸ of the night.
 Ofttimes, when all the village lights are out,
 And the wide air is still, I hear thee chant⁹
 Thy hollow dirge,¹⁰ like some recluse¹¹ who takes
 His lodgings in the wilderness of woods,
 And lifts his anthem¹² when the world is still;
 And the dim, solemn night, that brings to man
 And to the herds deep slumbers, and sweet dews

* This is the opinion of Wilson, the ornithologist; but Audubon thinks the sound is produced by the sudden outspreading of the wings of the bird to arrest its rapid flight.

To the red roses and the herbs, doth find
No eye, save thine, a watcher in her halls.
I hear thee oft at midnight, when the thrush
And the green roving linnet are at rest,
And the blithe¹³ twittering swallows have long ceased
Their noisy note, and folded up their wings."—M'LELLAN.

7. The chuck-wills-widow, which is a near relative of the whippoorwill, although seldom found north of Virginia and Tennessee, is so called from its notes, which seem to articulate the syllables of its name with wonderful distinctness. The tones of its voice are stronger and more full than those of the whippoorwill, and, like the latter, it keeps up a continual noise during the evening, and, in moonlight, throughout the whole of the night. Neither this bird nor the whippoorwill makes any nest, but both deposit¹⁴ their eggs on the dry leaves in the woods.

8. The *bee-eaters*, which derive their name from their great partiality for bees and wasps, are entirely confined to the Eastern hemisphere. The *swallows*, which include the martins, chimney-swallows, barn-swallows, bank-swallows, swifts, and a few other species, are a widely-dispersed and well-known family, resembling the night-jars in the deep clefts of their bills, but differing from them in being active during the day.

9. Speaking of swallows, Sir Humphrey Davy observes, "The swallow is one of my favorite birds, and a rival of the nightingale; for he glads my sense of seeing as much as the other does my sense of hearing. He is the joyous prophet of the year—the harbinger of the best season. He lives a life of enjoyment among the loveliest forms of Nature. Winter is unknown to him; and he leaves the green meadows of England in autumn for the myrtle and orange-groves of Italy, and for the palms of Africa."

10. A French writer, the Duke of Nemours, gives the following account of what fell under his own observation: "I observed," he says, "a swallow which had unhappily, and I can not imagine in what manner, slipped its foot into a knot of pack-thread, the other end of which was attached to a spout of the college building. Its strength was exhausted.

It hung at the end of the thread, uttering cries, and sometimes raising itself, as if making an effort to fly away.

11. "All the swallows in and around Paris, and perhaps from places more remote, soon assembled, to the number of several thousands. Their flight was like a cloud; all uttering a cry of pity and alarm. After some hesitation and a tumultuous council, one of them hit upon a device for delivering their companion, communicated it to the rest, and all at once began to put it into execution.

12. "They arranged themselves in a long line, flew rapidly past the poor prisoner, and, in passing, struck the pack of thread with their bills. These efforts, directed to one point, were continued for half an hour, when the thread was severed and the captive set free. But the flock remained until night, chattering continually in a tone which no longer betrayed anxiety, and seeming to be congratulating each other, and talking over the story of their achievements."¹⁵

13. The *todies*, which are a small family of beautiful birds, somewhat resembling the kingfishers, are found chiefly within the tropics of both hemispheres. The bright red spot on the throat of the green tody of the West Indies is said to attract insects, just as a candle attracts moths. The *trogons* are also a small family, but one pre-eminent in beauty and brilliancy of coloring, which is usually a metallic golden-green, strongly contrasted with scarlet, black, and brown.

14. The *kingfishers*, which are generally birds of gay plumage, are distributed over the world; but the warmer parts of India, Africa, and South America have the greatest share. This bird delights in murmuring streams and falling waters; not, however, merely that they may soothe his ear, but for a gratification somewhat more substantial. Amid the roar of the cataract, or over the foam of a torrent, he sits perched upon an overhanging bough, glancing his piercing eye in every direction below for his scaly prey, which, with a sudden circular plunge, he sweeps from its native element, and swallows in an instant. The kingfisher has a loud and harsh voice, and builds his nest in holes which he digs in the banks of streams. When the mother-bird is disturbed on the nest, she will frequently drop on the water, as if severe-

ly wounded, and flutter as if unable to rise from the stream, in order to induce the intruder to wade or swim after her.

- 1 CLĒFT, divided ; parted.
 2 CON-GĒN'-IAL, suitable.
 3 GUA'-CHĀ-BO.
 4 BOOM'-ING, roaring like waves.
 5 PIN'-IONS (*pîn'-yons*), wings.
 6 ĀR-TIC'-Ū-LĀTE, to utter distinctly.
 7 FĪT'-FUL, varied ; unsteady.
 8 WATCH'-ES, hours ; periods.

- 9 CHĀNT, to sing.
 10 DIRĒE, a song expressing grief, as a funeral *dirge*.
 11 RE-CLŪSE', a hermit.
 12 ĀN'-THEM, a hymn.
 13 BLĪTHE, merry ; gay.
 14 DE-PŌS'-IT, leave ; place.
 15 A-CHIEVE'-MENTS, great or heroic actions

LESSON XIII.

"THE FOWLS OF THE AIR SHALL TEACH THEE."

1. A SWALLOW, in the spring,
 Came to our grānary, and 'neath the eaves
 Essayed to make a nest, and there did bring
 Wet earth, and straw, and leaves.
2. Day after day she toiled
 With patient art' ; but ere her work was crowned',
 Some sad mishap the tiny fabric spoiled,
 And dashed it to the ground.
3. She found the ruin wrought ;
 Yet not cast down, forth from her place she flew,
 And with her mate fresh earth and grasses brought,
 And built her nest anew.
4. But scarcely had she placed
 The last soft feather on its ample floor,
 When wicked hand, or chance, again laid waste
 And wrought the ruin o'er.
5. But still her heart she kept,
 And toiled again ; and last night, hearing calls,
 I looked, and lo ! three little swallows slept
 Within the earth-made walls.
6. What truth is here, O man' ?
 Hath hope been smitten in its early dawn' ?
 Have clouds o'ercast thy purpose, trust, or plan' ?
 Have faith and struggle on.

R. S. S. ANDROS.

LESSON XIV.



THE SWALLOW PARTY.

1. "THE welcome guest of settled spring,
The swallow, too, has come at last;
Just at sunset, when thrushes sing,
I saw her dash with rapid wing,
And hail'd her as she pass'd.
2. "Come, summer visitant, attach
To my reed roof your nest of clay,
And let my ear your music catch,
Low twittering underneath the thatch
At the gray dawn of day."—CHARLOTTE SMITH.
3. Two barn swallows came into our wood-shed in the spring-time. Their busy, earnest twitterings led me at once to suspect that they were looking out a building-spot; but, as a carpenter's bench was under the window, and hammer-

ing, sawing, and planing were frequently going on, I had little hope they would choose a location¹ under our roof.

4. To my surprise, however, they soon began to build in the crotch of a beam over the open door-way. I was delighted, and spent much time in watching them. It was, in fact, a beautiful little drama² of domestic love; the mother-bird was so busy and important, and her mate was so attentive. He scarcely ever left the side of the nest. There he was, all day long, twittering in tones that were most obviously the outpourings of love.

5. Sometimes he would bring in a straw or a hair to be interwoven in the precious little fabric. One day my attention was arrested by a very unusual twittering, and I saw him circling round with a large downy feather in his bill. He bent over the unfinished nest, and offered it to his mate with the most graceful and loving air imaginable; and when she put up her mouth to take it, he poured forth such a gush of glad-some sound! It seemed as if pride and affection had swelled his heart till it was almost too big for his little bosom.

6. During the process of incubation³ he volunteered to perform his share of household duty. Three or four times a day he would, with coaxing twitterings, persuade his patient mate to fly abroad for food; and the moment she left the eggs, he would take her place, and give a loud alarm whenever cat or dog came about the premises. When the young ones came forth he shared in the mother's toil, and brought at least half the food for his greedy little family.

7. When the young became old enough to fly, the gravest philosopher would have laughed to watch their manœuvres. Such chirping and twittering! such diving down from the nest, and flying up again! such wheeling round in circles, talking to the young ones all the while! such clinging to the sides of the shed with their sharp claws, to show the timid little fledgelings⁴ that there was no need of falling!

8. For three days all this was carried on with increasing activity. It was obviously an infant flying-school. But all the talking and twittering were of no avail. The little downy things looked down, and then looked up, and, alarmed at the wide space around them, sank down into the nest again.

9. At length the parents grew impatient, and summoned their neighbors. As I was picking up chips one day, I found my head encircled by a swarm of swallows. They flew up to the nest, and chattered away to the young ones; they clung to the walls, looking back to tell how the thing was done; they dived, and wheeled, and balanced, and floated in a manner perfectly beautiful to behold.

10. The pupils were evidently much excited. They jumped up on the edge of the nest, and twittered, and shook their feathers, and waved their wings, and then hopped back again, as if they would have said, "It is pretty sport, but we can not do it."

11. Three times the neighbors came in and repeated their graceful lessons. The third time two of the young birds gave a sudden plunge downward, and then fluttered, and hopped, till they alighted on a small log. And O, such praises as were warbled by the whole troop! the air was filled with their joy! Some flew round, swift as a ray of light; others perched on the hoe-handle and the teeth of the rake; multitudes clung to the wall; and two were swinging, in the most graceful style, on a pendent⁵ hoop. Never, while memory lasts, shall I forget that swallow party.

12. The whole family continued to be our playmates until the falling leaves gave token of approaching winter. For some time the little ones came home regularly to their nest at night. Their familiarity was wonderful. If I hung my gown on a nail, I found a little swallow perched on the sleeve. If I took a nap in the afternoon, my waking eyes were greeted by a swallow on the bedpost: in the summer twilight they flew about the sitting-room in search of flies, and sometimes lighted on chairs and tables. But at last they flew away to more genial⁶ skies, with a whole troop of relations and neighbors. It was painful to me to think that I should never know them from other swallows, and that they would have no recollection of me.

MRS. CHILD.

¹ Lo-cā'-tion, situation; building-place.

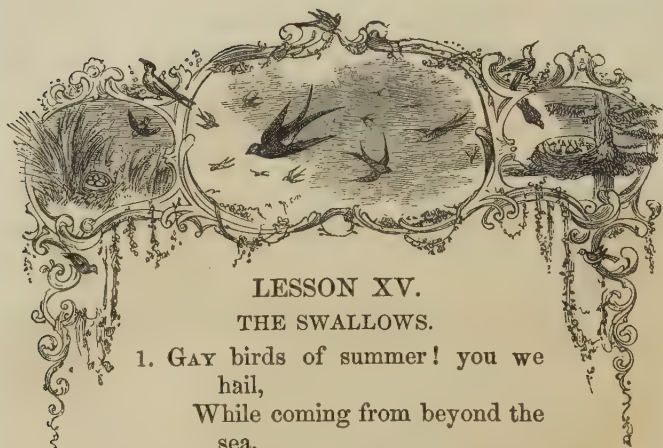
² DRĀ'-MA, representation; act of a play.

³ IN-cu-bā'-tion, sitting on eggs for the purpose of hatching young.

⁴ FLŶDGE'-LING, a young bird just furnished with feathers.

⁵ PEND'-ENT, hanging.

⁶ GE'-NI-AL, mild; cheerful; pleasant.



LESSON XV.
THE SWALLOWS.

1. GAY birds of summer! you we
 hail,
 While coming from beyond the
 sea,
 When flowers adorn the dewy vale,
 And blossoms hang upon the tree.
2. Ye love the spots where ye were reared,
 Where first ye stretched abroad your wings;
 These places seem to you endeared,
 Amid your many journeyings.
3. And there your little nests ye build,
 And nurse with care your tender brood;
 And skimming o'er the lake and field,
 Procure for them their daily food.
4. Oft have I marked your rapid flight,
 Ye happy birds! on sunny days,
 When earth was beautiful and bright,
 And warblers poured their sweetest lays.
5. And I have wished that I could fly
 With you afar, when winter lowers,
 To bask beneath a cloudless sky,
 Or roam among the myrtle bowers.

6. And I have wished to find a nest,
Where, undisturbed by care or strife,
In calm seclusion I might rest,
And pass the sunny hours of life:—
7. Where I might dwell, till o'er my head
Age stretched its deepening clouds of gloom,
And then my wings I'd heavenward spread,
To seek a land of bliss and bloom.
8. Gay birds! ye visit us when bright
The summer sun in glory shines;
But from our fields ye take your flight
When autumn day by day declines.
9. And so, like you, we often find
That those, in fortune's golden day,
Who seemed companions, loving, kind,
When storms arise will haste away.

Anon.

-
1. AND is the swallow gone' ?
Who beheld it' ?
Which way sailed it' ?
Farewell bade it none' ?
 2. No mortal saw it go :
But who doth hear
Its summer cheer
As it flitteth to and fro' ?
 3. So the freed spirit flies !
From its surrounding clay
It steals away
Like the swallow from the skies.
 4. Whither' ? wherefore doth it go' ?
'Tis all unknown' ;
We feel alone
That a void is left below.

WILLIAM HOWITT.

PERCHING BIRDS—*Continued.*

LESSON XVI.

THE CONE-BILLS (*CONIROSTRES*).

1. Red Tanager, or Scarlet Sparrow, *Tanager rubra*. 2. English Jay, *Corvus glandarius*. 3. Baltimore Oriole, *Oriolus Baltimore*. 4. Common Cross-bill, *Loxia curvirostra*. 5. Common Goldfinch, *Fringilla carduelis*. 6. American Blue Jay, *Corvus cristatus*. 7. Cardinal Grosbeak, *Loxia cardinalis*. 8. Senegal Touraco, *Corythaix Senegalensis*. 9. Raven, *Corvus corax*. 10. Magpie, *Corvus pica*. 11. Violet Plantain-eater, *Musophaga violacea*. 12. Meadow Lark, *Alauda Magna*.

1. IN the third division of the perchers are the birds which have cone-shaped bills. Seeds and grain are the principal food of these birds; and for picking these from their frequently hard coverings, as well as for crushing hard seeds, their stout and horny beaks are well fitted. These birds have been divided into the several families of the Crows, the Starlings, the Finches, the Horn-bills, and the Plantain-eaters.

2. In the crow family are included the well-known raven (the "corbie" of Scotland), celebrated from time immemorial as a bird of evil omen; that thief and vagabond the common crow, and his near cousins the rooks, both pests of the corn-

fields; the European jackdaw, the mischievous blue jay, the chattering magpies, and the nut-crackers. The latter have the most perfect of the cone-shaped bills. The well-known blue jay, whose screaming voice sounds among his fellow musicians of the woods like the harsh notes of a trumpeter, is found only in North America. A writer who has well described him says, "He is distinguished as a kind of beau among the feathered tenants¹ of our woods by the brilliancy of his dress; and, like most other coxcombs,² he makes himself still more conspicuous by his loquacity,³ and the address of his tones and gestures."

3. The magpie, which is much better known in Europe than in this country, is about eighteen inches in length, and is noted for his pilfering and restless habits, and noisy manners, as well as for his gay plumage, which is a velvety black, intermingled with white, blue, and green. He is easily taught to imitate the human voice. This same bird has been found in considerable numbers in portions of the country west of the Mississippi; but it has been noticed that where the magpie is found the blue jay is unknown, as if the territorial boundaries of these two noisy and voracious⁴ families had been mutually agreed on.

4. Plutarch tells us of a magpie belonging to a barber at Rome which could imitate almost every word it heard. Some trumpets happened one day to be sounded before the shop, and for a day or two afterward the magpie was quite mute, and seemed pensive and melancholy. All who knew it were greatly surprised at its silence; and it was supposed that the sound of the trumpets had so stunned it as to deprive it at once of both voice and hearing.

5. It soon appeared, however, that this was far from being the case; for, says Plutarch, the bird had been all the time occupied in profound meditation, studying how to imitate the sound of the trumpets; and when at last master of it, the magpie, to the astonishment of all its friends, suddenly broke its long silence by a perfect imitation of the flourish of trumpets it had heard, observing with the greatest exactness all the repetitions, stops, and changes. The acquisition of this lesson had, however, exhausted the whole of the magpie's

stock of intellect, for it made it forget every thing it had learned before.

6. Among the starlings are included the common and red-winged starlings, the meadow starling or meadow lark, and the several species of blackbirds. Although our meadow lark can not boast the powers of song which distinguish that "harbinger of day," the skylark of Europe, yet in richness of plumage,



The common Starling.

as well as in sweetness of voice, so far as his few notes extend, he is eminently its superior.

7. Our common blackbird, called also the purple grackle, is a well-known plunderer of corn-fields; yet his merry presence adds a charm to the mellow days of autumn, and we would not willingly part with him.

"In the last days of autumn, when the corn
Lies sweet and yellow in the harvest-field,
And the gay company of reapers bind
The bearded wheat in sheaves, then peals abroad
The blackbird's merry chant. I love to hear,
Bold plunderer, thy mellow burst of song
Float from thy watch-place on the mossy tree,
Close by the corn-field edge."

8. In the group of starlings are also included the orioles, or hang-nests, of which the Baltimore oriole, also known as the golden robin, firebird, and fire-hangbird, is the most noted. The head, back, and wings of the oriole are black, and the lower parts and breast of a golden orange. In constructing his hanging nest, the oriole displays great ingenuity in using the best materials which he can procure; and skeins of stolen silk and thread are frequently found interwoven in the fabric.

9. "High on yon poplar, clad in glossiest green,
The orange black-capped Baltimore is seen;

The broad, extended boughs still please him best;
 Beneath their bending skirts he hangs his nest;
 There his sweet mate, secure from every harm,
 Broods o'er her spotted store, and wraps them warm;
 Lists to the noontide hum of busy bees,
 Her partner's mellow song, the brook, the breeze;
 These day by day the lonely hours deceive,
 From dewy morn to slow descending eve.

10. Two weeks elapsed,^a behold! a helpless crew
 Claim all her care, and her affection too;
 On wings of love the assiduous^b nurses fly;
 Flowers, leaves, and boughs abundant food supply.
 Glad chants her guardian as abroad he goes,
 And waving breezes rock them to repose."

11. The finches, which are the smallest of the perchers, are, for the most part, excellent songsters. In this numerous family are found the weaver birds, celebrated for their curious hive-shaped nests, the buntings, and snowbirds, the latter visiting us in winter only from the frozen regions of the north, the indigo-bird, the hawfinch, groundfinch, our common Canary bird, and the American yellow-bird, known also as the thistle-finch or goldfinch.

"I love to see the little goldfinch pluck
 The seed from thistle's tuft, and twit, and twit;
 And then, in some gay bower of blossoms perched,
 Trim his gay suit, and pay us with a song:
I would not hold him prisoner for the world."

12. In the same group is found the English chaffinch, which has been described

"As brisk, as merry, and as loved a bird
 As any in the fields and woodlands heard."

Here are also found the cross-bills, the linnets, and many others that are often called sparrows, among which are the song-sparrow and the well-known chipping-bird. In this goodly company we also place the English skylark:

"Shrill-voiced and loud, the messenger of morn,
 Ere yet the shadows fly, he, mounted, sings
 Amid the dawning clouds."

"Type of the wise, who soar, but never roam;
 True to the kindred points of heaven and home."

13. The horn-bills and plantain-eaters are mostly birds of

large size, confined to Africa, India, and the adjacent islands. Among the plantain-eaters are several species of the touracos, which have great brilliancy of plumage, elegance of form, and grace of motion. It has been said of the violet plantain-eater, that "while other birds are pretty, handsome, splendid, gorgeous, beautiful, the coloring of the plantain-eater is truly *regal*." The engraved picture of this bird, without its coloring, conveys a very inadequate⁷ idea of its beauty.

¹ TĒN'-ANTS, inhabitants.

² ŒŒX'-ŒŒMB, a fop; a vain, showy fellow.

³ LO-QUĀŒ'-I-TY, talkativeness.

⁴ VO-RĀ'-CIOUS, greedy for eating; hungry.

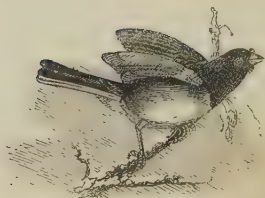
⁵ E-LĀPS'ED, passed by.

⁶ AS-SID'-Ū-ŒUS, attentive; careful.

⁷ IN-ĀD'-E-QUATE, insufficient; imperfect.

LESSON XVII.

THE SNOWBIRD (*Fringilla Hyemalis*).



1. THE well-known snowbird is one of our visitants from the frozen regions of the north, coming even from beyond the arctic circle, and spreading over the United States in small flocks at the beginning of winter. At first they hover around the borders of woods; but as the

weather sets in colder, they approach the farm-houses and villages in diligent search of food.

2. Their increased activity on such occasions is generally a sure prognostic¹ of a storm. On the first indications of spring many of them set out on their return to the north, while others first visit high ranges of mountains, where they build their nests and rear their young previous to their departure. The plumage of the snowbird undergoes² considerable changes. The snow-bunting is a bird somewhat similar to this, but has more pointed wings. The following lines to the snowbird contain both poetic and moral beauty:

3. "Oh! what will become of thee, poor little bird?"

The muttering storm in the distance is heard;

The rough winds are waking, the clouds growing black,

They'll soon scatter snow-flakes all over thy back!

rough & plum

From what sunny clime hast thou wandered away?
And what art thou doing this cold winter day?

“ ‘I’m picking the gum from the old peach-tree;
The storm doesn’t trouble me. Chee, dee, dee.’ ”

4. “ ‘But what makes thee seem so unconscious of care?
The brown earth is frozen, the branches are bare:
And how canst thou be so light-hearted and free,
As if danger and suffering thou never should’st see,
When no place is near for thy evening nest,
No leaf for thy screen,³ for thy bosom no rest?’ ”

“ ‘Because the same hand is a shelter to me,
That took off the summer leaves. Chee, dee, dee.’ ”

5. “ ‘But man feels a burden⁴ of care and of grief,
While plucking the cluster and binding the sheaf.
In the summer we faint, in the winter we’re chilled,
With ever a void⁵ that is yet to be filled.
We take from the ocean, the earth, and the air,
Yet all their rich gifts do not silence our care.’ ”

“ ‘A very small portion sufficient will be,
If sweetened with gratitude. Chee, dee, dee.’ ”

6. “ ‘I thank thee, bright monitor;⁶ what thou hast taught
Will oft be the theme⁷ of the happiest thought;
We look at the clouds; while the *birds* have an eye
To *Him who reigns over them*, changeless and high.
And now, little hero, just tell me thy name,
That I may be sure whence my oracle⁸ came.’ ”

“ ‘Because, in all weather, I’m merry and free,
They call me the Winter King. Chee, dee, dee.’ ”

7. “ ‘But soon there’ll be ice weighing down the light bough,
On which thou art flitting so playfully now;
And though there’s a vesture⁹ well fitted and warm,
Protecting the rest of thy delicate form,
What, then, wilt thou do with thy little bare feet,
To save *them* from pain, ’mid the frost and the sleet?’ ”

“ ‘I can draw them right up in my feathers, you see,
To warm them, and fly away. Chee, dee, dee.’ ”

MISS GOULD.

¹ PROG-NÖS’-TIC, a sign by which a future event may be known.

² UN-DER-GÖES’, passes through.

³ SCREEN, that which shelters from danger.

⁴ BÜR’-DEN, load; weight.

⁵ VOID, want; longing.

⁶ MÖN’-I-TOR, one who warns of faults or informs of duties.

⁷ THEME, subject.

⁸ ÖR’-A-CLE, a wise saying of great authority.

⁹ VĚST’-URE, garment.

LESSON XVIII.

THE SONG-SPARROW (*Fringilla Melodia*).

1. "OF all our sparrows, the song-sparrow, or melodious finch, is the most numerous, the most generally diffused over the United States, and by far the earliest, sweetest, and most lasting songster. It is the first singing bird of spring, taking pre-

cedence¹ even of the bluebird, and it often remains until the depth of winter. The notes or chant of its song are short, but very sweet, resembling the beginning of the canary's song. It usually builds its nest on the ground, under a tuft of grass. As far south as Louisiana it rears three broods in one season; and, unlike most other birds, it builds a new nest for each."—WILSON. It is usually found in company with the chipping-bird, and birds of that class. It seems to represent, in America, the house-sparrow of Europe, but is less bold and crafty than the latter bird. The following tribute to the song-sparrow is full of sentiment and beauty:

2.

"Joy fills the vale;— *1st*

With joy ecstatic² quivers every wing,
As floats thy note upon the genial³ gale,
Sweet bird of spring! *2nd*

3.

"The violet

Awakens at thy song, and peers⁴ from out
Its fragrant nook, as if the season yet
Remained in doubt;

4.

"While from the rock

The columbine its crimson bell suspends,
That careless vibrates,⁵ as its slender stalk
The zephyr⁶ bends.

5.

"Say! when the blast

Of winter swept our whitened plains—what clime,
What sunnier realms thou charmedst, and how was past
The joyous time?

6. "Did the green isles
Detain thee long? or, 'mid the palmy groves
Of the bright south, where nature ever smiles,
Didst sing thy loves?
7. "Oh, well I know
Why thou art here thus soon, and why the bowers
So near the sun have lesser charms than now
Our land of flowers:
8. "Thou art returned
On a glad errand—to rebuild thy nest,
And fan anew the gentle fire that burned
Within thy breast!
9. "And thy wild strain,
Poured on the gale, is love's transporting voice—
That, calling on the plummy⁷ choir⁸ again,
Bids them rejoice.
10. "Nor calls alone
To enjoy, but bids improve the fleeting hour—
Bids all that ever heard love's witching tone,
Or felt his power.
11. "The poet, too,
It soft invokes⁹ to touch the trembling wire;¹⁰
Yet ah! how few *its* sounds shall list, how few
His song admire!
12. "But *thy* sweet lay,
Thou darling of the spring! *no* ear disdains;
Thy sage instructress, Nature, says, 'Be gay!'
And prompts thy strains.¹¹
13. "Oh, if I knew
Like thee to sing—like thee the heart to fire—
Youth should enchanted throng, and beauty sue
To hear my lyre.¹²
14. "Oft as the year
In gloom is wrapped, thy exile I shall mourn—
Oft as the spring returns, shall hail sincere
Thy glad return."

H. PICKERING.

¹ PRE-CĒD'-ENCE, the act or state of being first.² EE-STĀT'-IE, delightful beyond measure.³ ĒE'-NI-AL, enlivening; cheerful.⁴ PEEPS, peeps forth.⁵ VĪ'-BRĀTES, moves to and fro.⁶ ZĒPH'-YE, a soft mild breeze.⁷ PLŪM'-Y, feathered.⁸ CHOIR (*kwire*), singers.⁹ IN-VŌKE', call upon.¹⁰ WĪRE, here used for stringed instrument of music.¹¹ STRĀINE, songs.¹² LYRE, a kind of harp.

LESSON XIX.

THE ENGLISH SKYLARK.

1. BIRD of the wilderness,
 Blithesome¹ and cumberless,²
 Sweet be thy matin³ o'er moorland⁴ and lea!⁵
 Emblem of happiness,
 Blest is thy dwelling-place—
 O, to abide in the desert with thee!

2. Wild is thy lay,⁶ and loud,
 Far in the downy cloud,
 Love gives it energy, love gave it birth,
 Where on thy dewy wing—
 Where art thou journeying?
 Thy lay is in heaven, thy love is on earth.

3. O'er fell⁷ and fountain sheen,⁸
 O'er moor and mountain green,
 O'er the red streamers that herald the day,
 Over the cloudlet dim,
 Over the rainbow's rim,
 Musical cherub, soar, singing away!

4. Then, when the gloaming⁹ comes,
 Low in the heather¹⁰ blooms,
 Sweet will thy welcome and bed of love be!
 Emblem of happiness,
 Blest is thy dwelling-place—
 O, to abide in the desert with thee!

JAMES HOGG.

¹ BLITHÉ'-SÔME, gay; cheerful.² CÛM'-BEE-LESS, free; light; airy.³ MÂT'-IN, morning song.⁴ MOOR'-LAND, a marshy tract.⁵ LEA, a meadow or plain.⁶ LÂY, a song.⁷ FÉLL, a barren or stony hill.⁸ SHEEN, bright; glittering.⁹ GLÔAM'-ING, evening twilight (*Scottish*).¹⁰ HEATH'-ER, pertaining to the heath plant, which is abundant in Scotland.

LESSON XX.



THE LARK AND THE ROOK.

1. "Good-night, Sir Rook!" said a little lark,
"The daylight fades—it will soon be dark;
I've bathed my wings in the sun's last ray,
I've sung my hymn to the dying day;
So now I haste to my quiet nook¹
In yon dewy meadow—good-night, Sir Rook."
2. "Good-night, poor lark!" said his titled friend,
With a haughty toss and a distant bend;
"I also go to my rest profound,
But not to sleep on the cold, damp ground;
The fittest place for a bird like me
Is the topmost bough of yon tall pine-tree."
3. "I opened my eyes at peep² of day,
And saw you taking your upward way,
Dreaming your fond romantic dreams,
An ugly speck in the sun's bright beams;
Soaring too high to be seen or heard—
And said to myself, What a foolish bird!

4. "I trod the park with a princely air;
 I fill'd my crop with the richest fare;
 I caw'd³ all day 'mid a lordly crew,
 And I made more noise in the world than you!
 The sun shone full on my ebon⁴ wing;
 I looked and wondered—good-night, poor thing!"
5. "Good-night, once more," said the lark's sweet voice,
 "I see no cause to repent my choice;
 You build your nest in the lofty pine,
 But is your slumber more soft than mine?
 You make more noise in the world than I,
 But whose is the sweeter minstrelsy?"⁵

Wayside Gatherings.

¹ NOOK, corner.

² PREP, dawn.

³ CAW, to cry like a crow, rook, or raven.

⁴ EB'-ON, black.

⁵ MIN'-STREL-SY, singing. The occupation of a musical performer.

LESSON XXI.

BIRDS IN SUMMER.

- How pleasant the life of a bird must be,
 Flitting about in each leafy tree;
 In the leafy trees, so broad and tall,
 Like a green and beautiful palace hall,
 With its airy chambers, light and boon,
 That open to sun, and stars, and moon,
 That open unto the bright blue sky,
 And the frolicsome winds as they wander by!
- What a joy it must be, like a living breeze,
 To flutter about 'mong the flowering trees;
 Lightly to soar, and to see beneath
 The wastes of the blossoming purple heath,
 And the yellow furze, like fields of gold,
 That gladden some fairy region old!
 On mountain tops, on the billowy sea,
 On the leafy stems of the forest tree,
 How pleasant the life of a bird must be!

MARY HOWITT.

THE PERCHING BIRDS—*Continued.*

LESSON XXII.

THE THIN-BILLS (*TENUIROSTRES*).

1. Purple Long-tailed Sunbird, *Nectarinea platyura*. 2. Emerald Bird of Paradise, *Paradisea apoda*. 3. Stokes's Humming-bird, *Trochilus Stokesii*. 4. Nepaul Sunbird, *Nectarinea Nepalensis*. 5. Malachite S. B., *Nectarinea famosa*. 6. Vieillot's H. B., *Trochilus chalybeus*. 7. Tufted-necked H. B., *Trochilus ornatus*. 8. Hoopoe, *Upupa epops*. 9. Red-throated H. B., *Trochilus colubris*. 10. Amethyst-throated S. B., *Nectarinea amethystina*. 11. Topaz-throated H. B., *Trochilus pella*.

1. THE thin-billed birds have been considered by an eminent naturalist¹ "the most interesting of the animal world," as the smallest birds and the most brilliantly adorned are contained in this group. Here are found the hoopoes, the delicate humming-birds, the sunbirds of the torrid zone, and the far-famed birds of Paradise.

2. The hoopoes, which are a group of brilliant African birds, occasionally seen in Europe, are not found in this country. One of these birds, which is of a reddish-gray and black color above, and white below, with an ample crest of orange-brown feathers, strays occasionally to the British isles, where it attracts considerable attention. An African species, not

found in Europe, is said to glitter in the sunlight with the most brilliant hues of azure² and emerald³ green.

3. The HUMMING-BIRDS, of which more than a hundred species are known to exist, are wholly confined to the American continent and the adjacent islands. These beautiful "flower birds," "the jewels of ornithology," have excited the admiration of all who have observed them, by their delicate forms and the dazzling splendor of their plumage.

"The humming-bird! the humming-bird!
So fairy-like and bright;
It lives among the sunny flowers,
A creature of delight."—MRS. HOWITT.

They are the smallest of the feathered races, some species being exceeded in size and weight by several of the insect tribe.

4. These fairy birds swarm in the tropical forests of South America, fairly covering the dense growth of wild flowers, whose blossoms only give way in beauty to the sparkling tints of their airy tenants.

"Like fairy sprites,⁴ a thousand birds
Glance by on golden wing;
Birds lovelier than the lovely hues
Of the bloom⁵ wherein they sing."

They also abound in gardens, and seem to delight in the society of man, becoming familiar and destitute of fear, hovering near a shrub in bloom while the flowers are plucked from the opposite side.

5. Only three or four species of humming-birds are found within the limits of the United States, and of these the red-throated, or northern humming-bird, well known for its golden-green back, purple wings, and ruby⁶-colored throat, is the most common. It is three inches and a half long from the tip of its bill to the end of its tail. It is often seen hovering among the arbors of honeysuckles and beds of flowers, poising⁷ itself in the air for the space of two or three seconds, with a murmuring noise made by the rapid motion of its scarcely visible wings, thrusting its long tubular tongue into the flowers in search of food, and then suddenly darting off with a rapidity so great that the eye can not follow it.

6. "When morning dawns, and the bless'd sun again
Lifts his red glories from the eastern main,⁸
Then round our woodbines, wet with glittering dews,
The flower-fed humming-bird his round pursues;
Sips with inserted tube the honeyed blooms,
And chirps his gratitude as round he roams;
While richest roses, though in crimson dress'd,
Shrink from the splendor of his gorgeous breast.
7. "The purple amethyst,⁹ the emerald's green,
Contrasted mingle with the ruby's sheen,
While over all a tissue is put on
Of golden gauze, by fairy fingers spun.
What heavenly tints in mingled radiance¹⁰ fly!
Each rapid movement gives a different dye;¹¹
Like scales of burnish'd gold they dazzling show,
Now sink to shade, now like a furnace glow."

8. Humming-birds were long supposed to feed only upon the honey or sweet juices of flowers, but later observations have proved that they feed upon insects also. The females are without the splendid plumage of the males, and are clothed in modest dress. The nests of the several species vary greatly in form and structure; but in all they are made of the softest, warmest, and most delicate materials.

9. The SUNBIRDS, so called from their splendid glossy plumage, which appears really gorgeous when played upon by the sunbeams, are found chiefly in the tropical regions of Asia and Africa, although a few species occur in South America and the adjacent islands. The appearance which these birds present has been thus described:

"Each spangled¹² back bright sprinkled specks adorn;
Each plume imbibes the rosy-tintured morn;
Spread on each wing the florid seasons glow,
Shaded and verged with the celestial bow;¹³
Where colors blend an ever-varying dye,
And, wanton,¹⁴ in their gay exchanges vie."¹⁵

10. The birds of Paradise, which are mostly natives of New Guinea, include some of the most singular and magnificent of the feathered tribes. The emerald bird of Paradise, which is about the size of a common pigeon, is the one best known, and is said to surpass all other birds in its beauty of form, and the vivid and changing tints of its plumage.

"Bright in the orient¹⁶ realms of morn,
All beauty's richest hues adorn
The bird of Paradise."—HEMANS.

Its body, breast, and lower parts are of a deep rich brown; the forehead is velvety black, spotted with green; the head yellow; the throat of a rich golden green; the sides of the tail of a golden yellow; in addition to which there are two long thread-like feathers which extend from the tail nearly two feet in length.

11. Of these long and beautiful feathers the bird is so proud that it will not suffer the least speck of dirt to remain on them; and it is constantly examining its plumage to see that there are no spots on it. In its wild state this bird always flies and sits with its face to the wind, lest its elegant plumes should be disarranged. The female is without the long floating plumes of the male, and her colors are less brilliant.

12. But, although Nature has robed in beauty the birds of the torrid zone, she has denied them the charms of song, while, with a wise compensation,¹⁷ she has given the latter to the more modest-robed denizens¹⁸ of colder climes. Thus, while prodigal¹⁹ of her gifts, she bestows them with a frugal²⁰ hand: she scatters blessings upon all, but gives not to each the *same* tokens of her favor.

"Wide o'er the winding umbrage²¹ of the floods,
Like vivid blossoms glowing from afar,
Thick swarm the brighter birds. For Nature's hand,
That with a sportive vanity has decked
The plummy nations, there her gayest hues
Profusely pours. *But, if she bids them shine,*
Arrayed in all the beauteous beams of day,
Yet frugal still, she humbles them in song."—THOMSON.

¹ NĀT'-Ū-RAL-IST, one who studies natural history.

² ĀZ'-ŪEE, the fine blue color of the sky.

³ ĒM'-E-RALD, a precious stone of a green color.

⁴ SPĒITE, a spirit.

⁵ BLOOM, blossoms; flowers.

⁶ RŪ'-BY, red.

⁷ POIS'-ING, balancing.

⁸ MĀIN, the sea.

⁹ ĀM'-E-THYST, a precious stone of a bluish violet color.

¹⁰ RĀ'-DI-ANCE, vivid brightness.

¹¹ DYE, hue; color.

¹² SPĀN'-GLED, covered with brilliant spots or spangles.

¹³ BŌW, the rainbow.

¹⁴ WĀN'-TON, sportive; frolicsome.

¹⁵ VĪE, strive for superiority.

¹⁶ Ō'-RI-ENT, eastern.

¹⁷ ĊOM-PEN-SĀ'-TION, that which is given to make up some loss.

¹⁸ DĒN'-I-ZENS, inhabitants.

¹⁹ PRŌD'-I-GAL, profuse.

²⁰ FRŪ'-GAL, not wasteful.

²¹ ŪM'-BRAGE, shade; screen of trees.

III. CLIMBERS (*SCANSORES*).

LESSON XXIII.



1. Great Green Macaw, *Macrocerus militaris*. 2. Nuthatch, *Sitta Carolinensis*. 3. Red-billed Toucan, *Ramphastos erythorhynchus*. 4. Papuan Lory, *Psittacus Papuensis*. 5. Crested Cockatoo, *Polytelopus Leadbeateri*. 6. Swindern's Love Bird, *Agapornis Swindernianus*. 7. Alexandrine Ring-Parakeet, *Palaeornis Alexandri*. 8. House Wren, *Sylvia domestica*. 9. Carolina Parrot, *Psittacus Carolinensis*. 10. Red-headed Woodpecker, *Picus erythrocephalus*. 11. Golden-winged Woodpecker, *Picus auratus*. 12. American Cuckoo, *Cuculus Americanus*.

1. THE third order of birds, which is included by some in the great division of the perchers, is composed of what are called the climbing birds, most of which are distinguished from the birds of the other orders by having two toes turned backward and two forward, a provision¹ which eminently² fits them for climbing the trunks of trees and hanging among their branches. In this division are found the woodpeckers, the creepers, the toucans, the cuckoos, and the parrots.

2. Of the numerous family of the woodpeckers, which are widely scattered over both the Eastern and Western continents, twenty different species are found within the United States. Of these the golden-winged and the red-headed seem

to be universally known. The habits of all are much alike, as all of them dig into trees with their strong bills, and strip off the bark to find the worms and insects concealed beneath. The allied³ family of the creepers includes the nuthatches and those familiar little birds, the wrens.

3. Alexander Wilson, the ornithologist,⁴ gives a curious account of a pair of wrens which had built in a box by his bedroom window. The nest had been completed, and two eggs had been laid, when, the window and door of the room having been left open, the female wren entered to reconnoiter;⁵ and, venturing too far, was sprung upon by the cat and destroyed.

4. "Curious," he adds, "to see how the widowed survivor would behave on the tragical occasion, I watched him carefully for several days. At first he sung with great vivacity for an hour or so, but, becoming uneasy, he went off for half an hour. On his return he chanted as before, and went to the top of the house, stable, and weeping-willow, that his lost mate might hear. But as he could neither see nor hear any thing of her, he returned again to visit the nest, ventured cautiously in at the window, and gazed about with suspicious looks, sinking his voice to a low, melancholy note as he stretched his little neck about in every direction.

5. "Returning to the box, he seemed, for some minutes, at a loss what to do, and then went off, as I supposed, altogether, for I saw him no more that day. Toward the afternoon of the second day, however, he again made his appearance, accompanied by a female wren, which seemed exceedingly timorous⁶ and shy; but, after some hesitation, she entered the box.

6. "At this moment the little widower, or bridegroom, seemed as though he would warble out his very life in an ecstasy⁷ of joy. After remaining in about half a minute, they both flew off, but returned in a few minutes, and instantly began to carry out the eggs, the feathers, and some of the sticks, supplying the place of the latter two with materials of the same sort. They ultimately succeeded in raising a brood of seven young, all of which escaped in safety."

7. Many poets have sung of the gallant attention of the

male wren to his mate during the period of incubation.⁸ We quote the following :

“Within thy warm and mossy cell,
Where scarce 'twould seem thyself could dwell,
Twice eight, a speckled brood, we tell,
Nestling beneath thy wing;
And still unwearied, many a day,
Thy little partner loves to stay,
Perch'd on some trembling timber spray,⁹
Beside his mate to sing.”—WOOD.

8. And to the same purpose, Wordsworth, in his well-known lines “On a Wren’s Nest,” beautifully says,

“There to the breeding bird, her mate
Warbles by fits his low, clear song,
And by the busy streamlet both
Are sung to all day long.”

9. The toucans, which are all natives of tropical America, are an interesting family of large forest birds, clothed with brilliant plumage. They are easily recognized by the great size of the beak, which, in some of the species, is nearly as large and as long as the body itself; and yet it is rendered remarkably light by its honey-comb structure. The toucan takes great care of its bill, packing it away carefully in the feathers of its back before sleeping.

10. The cuckoos are a small family of half-perching and half-climbing birds. Of the few that are found in northern climes, the common European cuckoo has ever been regarded with great interest, as its melodious but rather mournful note in early spring, heralding¹⁰ the return of sunny skies and bursting vegetation, carries with it dear associations in every country where it is known.

11. And yet the reputation of this bird is bad; for it makes no nests of its own, but steals into the nests of other birds, and leaves to them the whole care of its eggs and its young. Nor is this all. The young cuckoo has the remarkable faculty of getting rid of its companions in the nest by creeping under them and throwing them out, by which means it secures to itself all the attention and care of its foster-parent.¹¹ The American yellow-billed cuckoo, we are happy to say, is a much more honorable bird than its European cousin, as it

builds its own nests, hatches its own eggs, and rears its own young.

¹ PRO-VY'SION, arrangement.

² ĒM'-I-NENT-LY, in a peculiar manner.

³ AL-LIED', related.

⁴ OR-NI-THŪL'-O-GIST, one who describes birds.

⁵ RE-CON-NOI'-TER, to examine; look around.

⁶ TĪM'-OR-OUS, timid; afraid.

⁷ Ēē'-STA-SY, extreme delight.

⁸ IN-CU-BĀ'-TION, the act of sitting on eggs for the purpose of hatching young.

⁹ TĪM'-BER SPRĀY, twig of a tree.

¹⁰ HĒR'-ALD-ING, announcing.

¹¹ FŌS'-TER-PĀR'-ENT, one who takes the place of a parent.

LESSON XXIV.



PARROTS.

1. THE parrots, which belong to the class of climbing birds, are remarkable for their gay, varied, and, in many instances, splendid plumage; their hooked and powerful bill; their thick, fleshy tongue; their intelligence and docility;¹ and the peculiar facility² with which many of them learn to imitate the human voice. The numerous members of this family are grouped under several divisions, such as parrakeets, macaws, the parrots proper, the cockatoos, and the lories.

2. The parrots are of nearly all colors, red, yellow, green,

blue, and scarlet. The crested cockatoo is nearly white, with a crest of bright yellow. The Papuan lory, a bird of graceful form and motions, is particularly noted for its scarlet plumes, which flash with exceeding brilliancy when the sunlight strikes upon them in the depth of its native forests.

“There, through the trunks, with moss and lichens³ white,
The sunshine darts its interrupted light,
And 'mid the cedar's darksome boughs illumines,⁴
With instant touch, the *lory's* scarlet plumes.”—BOWLES.

3. The parrots are mostly birds of warm climates; and in their native wilds, when climbing among the trees and hanging from the branches in every possible attitude,⁵ their movements are marked by an ease and grace of motion that we can never see exhibited in a state of confinement. Of one hundred and seventy of the parrot family that have been described, only one species is a native of the United States. Many interesting incidents illustrating the character and habits of these birds might be related. The following, by the poet Campbell, is believed to be a true story:

4. “A parrot from the Spanish Main,
Full young, and early caged, came o'er
With bright wings to the bleak domain
Of Mulla's⁶ shore.

5. “To spicy groves, where he had won⁷
His plumage of resplendent⁸ hue,
His native fruits, and skies, and sun,
He bade adieu.

6. “He changed these for the smoke of turf,
A heathery⁹ land and misty sky,
And turned on rocks and raging surf
His golden eye.

7. “But, fretted in our climate cold,
He lived and chattered many a day,
Until, with age, from green and gold
His wings grew gray.

8. “At last, when, blind and seeming dumb,
He scolded, laughed, and spoke no more,
A Spanish stranger chanced to come
To Mulla's shore

9. "He hailed the bird in Spanish speech,
The bird in Spanish speech replied,
Flapped round the cage with joyous screech,
Dropped down—and died."

CAMPBELL.

- | | |
|--|--|
| 1 DO-CĪL'-I-TY, teachableness; readiness to learn. | 6 MUL'-LA, here used for <i>Ireland</i> . |
| 2 FA-CĪL'-I-TY, ease; readiness. | 7 WŌN, obtained. |
| 3 LĪ'-CHEN (<i>li'-ken</i>), a plant; rock-moss. | 8 RE-SPLĒN'-DENT, brilliant; shining. |
| 4 IL-LŪMES', lights up. | 9 HĒATH'-ER-Y (<i>hēth'-er-y</i>), abounding with the plant called hēath or hēather. |
| 5 ĀT'-TI-TŪDE, position. | |

LESSON XXV.



THE CUCKOO AND THE SWALLOW.

- ONE morn a cuckoo thus attacked betimes
A swallow lately come from warmer climes:
"Ah! Madam Catchfly!"^a once again,
I see, by toil unawed',
Your ladyship has cross'd the Main!
How fare all friends abroad?^b
- "How goes the world?"^b come, tell' the news':
A little news is pleasant':
How do the folks in Turkey use
To speak of *birds* at present?^b

3. "What say the Georgian maids so pretty
About young Nightingale's dull ditty'?"^b
Do any praise it now'?" I fancy not'."
"Excuse' me'," said the swallow', "much they praise
His plaintive and melodious lays',
And call them charming', and I know not what'."
4. "Charming'!^a that's droll enough'; what says
The world, then, of my little friend Tomtit'?"^b
"Some call him *foppish* in his ways'—
But," said the swallow', "much they praise
His *plumage'* and his *wit'*."
"His wit'!^a that's well'," the cuckoo cried with glee,
"And what says all the world of me'?"
5. "Of you'!"^b exclaimed the wondering bird—
"Of you'!^a—in truth, sir, not a word'."
"What'!^a never'?"^a said the cuckoo, "never'!^a
Does no one talk of me'?"^c How'!^a—Why'!^a—
That's very strange', indeed', for *I*
Talk of myself' forever'."

^a See Rule II.^c See Rule I. for the reason of this inflection.^b See Rule III.^d See Rule X., Note.

THE CUCKOO.

1. THE cuckoo is noted for being a shy bird—for being often heard, but seldom seen. This fact is thus alluded to by the poet Wordsworth:

2. "O blithe new-comer'! I have heard—
I hear thee and rejoice.
O cuckoo'! shall I call thee bird',
Or but a wandering voice'?"
3. "The same that in my school-boy days
I listened to—that cry—
Which made me look a thousand ways,
In bush, and tree, and sky.
4. "To see thee did I often rove
Through woods and on the green;
And thou wert still a hope—a love—
Still longed for, never seen."

IV. THE SCRATCHERS OR POULTRY BIRDS (*RASORES*),

OFTEN CALLED THE GALLINACEOUS BIRDS.

LESSON XXVI.



1. Peacock, *Pavo cristatus*. 2. Ruffed Grouse, or Partridge, *Tetrao umbellus*. 3. Peacock Pheasant, *Polyplectron emphanum*. 4. Pinnated Grouse, *Tetrao cupido*. 5. Argus Pheasant, *Argus gigantus*. 6. Common Guinea-fowl, *Numida Meleagris*. 7. Turkey, *Meleagris gallopavo*. 8. Virginian Quail, *Ortyx Virginianus*. 9. Red Grouse-Ptarmigan, or English Moorfowl, *Lagopus Scoticus*.

1. THE fourth order of birds embraces that part of the feathered creation which is by far the most useful to man. The common barn-door fowls, the turkey, peacock, and Guinea-fowls; the many species of pigeons, and the various birds known as game, all fall in this division; and whether considered as wholesome articles of food, or as adornments to man's abode, they are universally esteemed, and by almost all nations are reared and domesticated¹ for their various uses.

2. As these birds are designed principally for abode upon the ground, they have strong legs and feet; and the hind toe, so important in perching and grasping, is often wanting, or

is very short; the nails also are short, or, when lengthened, always stretch out in a line with the toe. With the exception of the pigeons, the wings of these birds, not being designed for flight, are short and rounded, and the body heavy.

3. This order of birds has been variously divided by modern writers on ornithology into several great families, the most important of which are our common poultry, pheasants, pigeons, and grouse. Our domestic fowls were originally natives of Southern Asia, and in a wild state their originals are still found in the forests and jungles² of India.

4. It is well known that when the common hen has reared a brood of ducks instead of her natural progeny, and they take to the water, as their instinct teaches them, she is in a perfect agony, running round the brink of the pond, and sometimes flying into it, in hopes of rescuing her brood from the danger she supposes them to be in. Yet this natural antipathy to water may be in a great degree overcome, as the following anecdote shows:

5. "A hen, which had reared three broods of ducks in three successive years, became habituated to their taking to the water, and would fly to a large stone in the middle of the pond, and patiently and quietly watch her brood as they swam about it. The fourth year she hatched her own eggs, and finding that her chickens did not take to the water as the ducklings had done, she flew to the stone in the pond, and called them to her with the utmost eagerness. This recollection of the habits of her former charge is very curious."

6. In the pheasant family are found the pheasants, the turkeys, the peacocks, and the Guinea-fowls, all birds of large size and magnificent plumage. Pope's description of the dying pheasant has rendered that beautiful bird additionally famous:

"See! from the brake the whirring pheasant springs,
And mounts exulting on triumphant wings:
Short is his joy; he feels the fiery wound,
Flutters in blood, and, panting, beats the ground.

"Ah! what avail his glossy varying dyes,
His purple crest and scarlet-circled eyes;
The vivid green his shining plumes unfold,
His painted wings, and breast that flames with gold?"—POPE.

7. The following description of the common ring-necked pheasant, by another writer, will give a still better idea of the splendid appearance of the same bird :



“ Splendid his form : his eyes, of flaming gold,
Two fiery rings of living scarlet hold ;
His arching neck a varying beauty shows,
Now rich with azure, now with emerald glows ;
His swelling breast with glossy purple shines,
Chestnut his back, and waved with ebon lines ;
To his broad wings gay hues their radiance lend,
His mail-clad legs two knightly spurs defend.”

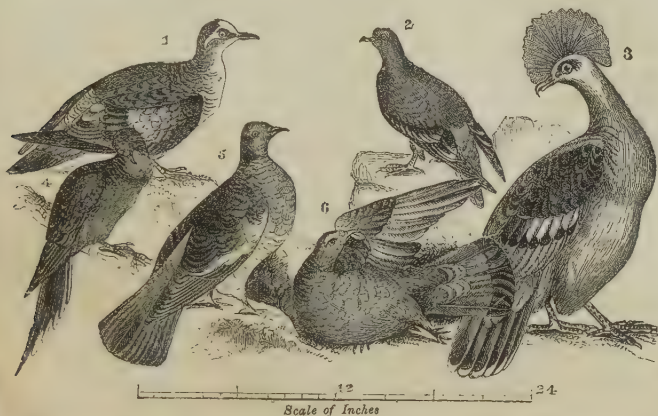
8. The pheasants and peacocks are natives of Southern Asia ; the turkey was found originally in North America, and the Guinea-fowls in Western Africa ; but all of them are now distributed over the civilized world. The splendor of the peacock attracted the attention of the mariners of King Solomon, who, in their southern expedition, obtained these birds and carried them to their royal master ; and at a period still more ancient, the beauty of this bird was referred to by the patriarch Job, who says, “ Gavest thou the goodly wings unto the peacocks ?”

9. The turkey is still found wild in large numbers in the forests of our Western States, migrating in large flocks in the latter part of autumn. The manner in which it escapes from the attacks of large owls is thus described by C. L. Bonaparte, in his work entitled³ “ American Ornithology :”

10. “ These birds are guardians of each other, and the first who sees a hawk or an eagle gives a note of alarm, on which all within hearing lie close to the ground. As they usually roost in flocks, perched on the naked branches of trees, they are easily discovered by the large owls ; but when attacked by these prowling birds, they often escape by a somewhat remarkable manœuvre. The owl sails around the spot to select his prey ; but, notwithstanding the almost inaudible⁴ action of his pinions, the quick ear of one of the slumberers perceives the danger, which is immediately announced to the whole party by a *chuck*.⁵

11. “ Thus alarmed, all rise on their legs, and watch the motions of the owl, who, darting like an arrow, would inevitably secure the individual at which he aimed, did not the

latter suddenly drop his head, squat, and spread his tail over his back: the owl then glances over, without inflicting any injury, at the very instant that the turkey suffers himself to fall headlong toward the earth, where he is secure from his dreaded enemy."



1. Bronze-winged Dove of Australia, *Columba chalcoptera*. 2. Wild Rock Pigeon, *C. livia*. 3. Crowned Goura Pigeon of Java, *C. coronata*. 4. Wild or Passenger Pigeon, *C. migratoria*. 5 and 6. English Ringdove, or Cushat, *C. palumbus*.

12. The pigeon or dove family, which unites the characters of the perchers and the poultry birds, has some species in nearly every quarter of the globe; but it is in the tropical climates of Southern Asia that the varieties—often vying with the parrots in the color of their plumage—are the most numerous. In no other country, however, does any one species swarm so abundantly as the wild pigeon in our own.

13. The celebrated American ornithologists, Wilson and Audubon, have very happily described the migrations of almost innumerable multitudes of wild pigeons which they saw in our Western country. The passing flocks were at times so large as to obscure the sun for hours together. The roosting-places of these birds presented a curious spectacle. Large trees were continually breaking down by the masses that settled on them; and the birds that were killed by the fall, and by the clubs of the people who gathered around the borders of the woods, literally piled the ground in heaps of thousands.

The noise occasioned by the continual flapping of wings was like thunder; persons could not hear each other speak; and the report of a gun a rod distant could scarcely be distinguished in the general uproar. On the departure of the birds, the forests looked as if they had been swept by a tornado.

14. In addition to the wild pigeon, and the common dove which is familiar to all, and which latter, in a wild state, is known as the wild rock pigeon, there are two other species in this country, one known as the Carolina turtle-dove, and the other as the Southern ground-dove, or ortolan. Our turtle-dove is a favorite bird with all who love to wander among our woods in spring, and listen to their varied harmony. Its peculiar mournful moanings, which sound so much like the voice of sorrow, are none other than the love-notes with which it woos its happy mate. The English ringdove, or cushat,⁶ is also noted for its cooing, and plaintive murmuring.

“Dear is my little native vale,
The ringdove builds and warbles there;
Close by my cot she tells her tale
To every passing villager.”—ROGERS.

15. Another important division of this order of birds is the grouse family, which embraces those large groups of *game* birds known in familiar language as grouse, partridges, quails, and ptarmigans. The names by which the several species of the grouse family are known vary greatly in different places. The engravings which we have given of several of these birds will convey a better knowledge of them than any description. The pinnated grouse is a very singular bird, peculiar to America alone, and is found in pine-barrens and prairie-lands. In New England the quail is often called a *partridge*; and in Pennsylvania the true partridge (or ruffed grouse) is usually called a *pheasant*. In early spring-time the partridge makes a loud drumming sound by beating his sides with his wings. This *drumming* is thus described by an American poet:

16. “‘Hearest thou that bird?’
I listened, and from ‘midst the depth of woods
Heard the love signal of the grouse that wears
A sable ruff around his mottled neck:
Partridge they call him by our northern streams,

And pheasant by the Delaware. He beats
 'Gainst his barred sides his speckled wings, and makes
 A sound like distant thunder; slow the strokes
 At first, then fast and faster, till at length
 They pass into a murmur, and are still."—BRYANT.

- ¹ DO-MĚS'-TI-Ē-TED, tamed; made domestic.
² JŮN'-GLE, land mostly covered with brush-wood.
³ EN-TĪ'-TLED, named; having the title of.
⁴ IN-AŮ'-DI-BLE, that can not be heard.
⁵ CHŮCK, the voice or call of a hen.
⁶ CUSH'-AT (pronounced *koosh'-at*).

LESSON XXVII.

THE CITY DOVE.

1. STROOP to my window, thou beautiful dove!
 Thy daily visits have touched my love.
 I watch thy coming, and list thy note
 That stirs so low in thy mellow throat,
 And my joy is high
 To catch the glance of thy gentle eye.
2. Why dost thou sit on the heated eaves,
 And forsake the wood with its freshened leaves?
 Why dost thou haunt the sultry street,
 When the paths of the forest are cool and sweet?
 How canst thou bear
 This noise of people—this sultry air?
3. Thou alone, of the feathered race,
 Dost look unscared on the human face;
 Thou alone, with a wing to flee,
 Dost love with man in his haunts to be;
 And the "gentle dove"
 Has become a name of truth and love.
4. Come then ever, when daylight leaves
 The page I read, to my humble eaves,
 And wash thy breast in the hollow spout,
 And murmur thy low, sweet music out.
 I hear and see
 Lessons of wisdom, sweet bird, in thee.

N. P. WILLIS.

V. THE RUNNERS (*CURSORES*).

LESSON XXVIII



1. Great Bustard, *Otis tarda*. 2. Trumpeter-bird, *Psophia crepitans*. 3. African Ostrich, *Struthio camelus*. 4. Emu of New Holland, *Emu dromaius*. 5. Cassowary of Asia, *Casuarus casuar*. 6. Apteryx, *Apteryx mantelli*. 7. American Ostrich, *Rhea Americana*.

1. THE fifth order of birds consists of the ostrich family, which is composed of long-legged birds of large size, most of them equaling the average height and bulk of the quadrupeds. But few of them are able to raise themselves from the earth by their wings. The principal birds of this order are the African ostrich, the South American ostrich, the cassowary of Eastern Asia, the emu of New Holland, the apteryx of New Zealand, and the bustards. The forms and comparative¹ size of these birds will be best learned from the engraving at the head of this lesson.

2. The African ostrich, or *camel-bird*, so called from its striking resemblance to the camel, is from seven to ten feet in height; and so swift and strong is it, that, with two men

mounted on its back, it will outstrip³ an English horse in speed. "What time she lifteth herself on high, she scorneth the horse and his rider."

"And the fleet-footed ostrich, over the waste,
Speeds, like a horseman that travels in haste."

Its cry so much resembles that of a lion as often to deceive the natives themselves. The long plumes of the wings and tail of the ostrich, which are either perfectly white or black, have long been an important article of commerce, although they are now frequently imitated from the feathers of other birds.

3. The African ostrich has excited the attention of mankind from the most remote ages. Its egg, which is a curiosity in itself, weighs nearly three pounds. The ostrich is frequently mentioned in the Book of Job, and in other portions of the Old Testament. "Gavest thou the goodly wings unto the peacock? or wings and feathers unto the ostrich, which leaveth her eggs in the earth, and warmeth them in the dust, and forgetteth that the foot may crush them, or that the wild beast may break them?" It is known that, in equatorial regions, the ostrich "leaveth her eggs in the earth," to be warmed and hatched by the sun, with little or no attention on the part of the mother; but, where the climate is colder, she hatches them in the usual manner.

4. The early Greek writers were well acquainted with the history and appearance of the ostrich; and among the Romans it was frequently exhibited in their games, and the brains of hundreds at a time were served up as a delicacy for the table. In its native haunts it is a shy bird, wary, restless, and difficult of approach; but, as an evidence of its dullness, it is said that, when closely pursued, if it can conceal its head in a hole or under a bush, it deems itself safe. In confinement the ostrich eagerly swallows stones, knives, spoons, and even broken glass, without injury.

5. The nandu, or American ostrich, which is only about half as large as the African bird, and less thickly covered with feathers, has the same propensity³ for swallowing iron, stones, etc., as the ostrich of the East. The cassowary of southeastern Asia is nearly as large as the ostrich, which it

much resembles; but its legs are thicker and stronger in proportion, and its head is covered with a kind of horny helmet, consisting of plates one over another. The emu of New Holland resembles the cassowary in most respects, but differs from it in not having the helmet. The small wings of these birds are of no use in flying, but serve to balance the body in running.

6. But the most singular of all the birds of this order is the New Zealand apteryx, which has neither wings nor a tail. Upon its very long and slender beak it sometimes leans in walking, using it as an old man would a cane. It is a nocturnal bird, feeding on worms, and pursuing its prey on the ground by smell rather than by sight. But this curious creature, which seems the last link in the bird creation, corresponding to the New Holland mole among quadrupeds, is becoming quite rare in its native clime,⁴ and, doubtless, in a few years the race will be extinct.⁵ Other birds of the ostrich family have been exterminated⁶ by human agency⁷ within a recent period; and of other species, larger than the ostrich, all we know is what can be learned from their fossil⁸ remains.

7. The bustards, which are large birds found only on the Eastern continent, are, like the ostrich, noted for their powers of running, although some of them will take wing when closely pursued. The great bustard, once numerous in England, is now of very rare occurrence there. The trumpeter-bird, found in South America, has by some been included with the bustards. It receives its name from the peculiar noise which it makes without opening its bill. When domesticated, it shows great fondness and fidelity; and is so regardful of its owner's interests that it attacks dogs and other animals that venture near him. Sometimes it is used to protect domestic poultry from the onsets⁹ of birds of prey.

COM-PĀR'-A-TĪVE, estimated by comparison; not real.

² OUT-STĒP', outrun.

³ PRO-PĒN'-SI-TY, natural tendency; disposition.

⁴ CLĪME, climate; country.

⁵ EX-TĪNĒT', at an end.

⁶ EX-TĒEM'-IN-Ā-TED, destroyed.

⁷ Ā'-ĜEN-OY, means; efforts; instrumentality.

⁸ FŌS'-SIL, dug out of the earth; petrified.

⁹ ŌN'-SETS, attacks.

VI. THE WADERS (*GRALLATORES*).

LESSON XXIX.



1. Roseate Spoonbill, *Platalea ajaja*. 2. Whooping Crane, *Ardea Americana*. 3. Glossy Ibis, *Ibis falcinellus*. 4. Red Flamingo, *Phoenicopterus ruber*. 5. American Bittern, *Ardea minor*. 6. Great Heron, *Ardea Herodias*. 7. White Stork, *Ciconia alba*. 8. Water Rail, *Rallus aquaticus*. 9. Woodcock, *Scolopax minor*. 10. African Stilt, or Plover, *Himantopus melanopterus*. 11. Common Snipe, *Scolopax gallinago*.

1. WE come now to that order of birds known as **WADERS**, which are distinguished by the great length of their legs, which fits them for wading; and also by their long beaks and necks, which are well adapted for seizing fish and the other aquatic¹ animals on which they feed. Their wings are long and powerful, and most of them migrate with the changing seasons. In this order are found the families of herons, spoonbills, ibises, snipes, plovers, and rails; and by some the flamingo also is placed in this division.

2. The family of the herons includes not only the herons proper, but also those kindred species, the storks, bitterns, and cranes. The great American heron, which is larger than the common heron of Europe, but of similar habits, is a great

destroyer of fish, and is usually found by the banks of streams, or along the sides of lakes and their islands, and in the latter parts of autumn and winter by the sea-shore. In the latter situations they take their station as soon as the shoals² begin to be uncovered by the ebbing³ of the tide; and, when satiated⁴ with feeding, rows of these birds may be seen on some retired sand-bank, their heads sunk between their shoulders, exhibiting a picture of full-fed laziness.

3. "Far up some brook's still course, whose current streams
The forest's blacken'd roots, and whose green marge
Is seldom visited by human foot,
The lonely heron sits, and harshly breaks
The Sabbath-silence of the wilderness;
And you may find her by some reedy pool,
Or brooding gloomily on the time-stain'd rock,
Beside some misty and far-reaching lake."—M'LELLAN.

4. Although the heron is a wading bird, and usually solitary in its habits, yet in the spring-time it congregates⁵ in flocks, and builds its nest in the tops of lofty trees, selecting for this purpose the gloomy solitudes of vast swamps that are difficult of access. The storks, which are numerous in Europe, often congregating about towns and villages, are a privileged bird wherever found, on account of the havoc⁶ which they make among noxious⁷ animals.

5. The following story is told of a wild stork which was brought by a farmer into his poultry-yard, to be the companion of a tame one which he had long kept there. The tame stork, disliking a rival, fell upon the poor stranger, and beat him so unmercifully that he was compelled to seek safety in flight. About four months afterward, however, he returned to the poultry-yard, recovered of his wounds, and attended by three other storks, who no sooner alighted than all four fell upon the tame stork and killed him.



6. The bittern, which hides by day and feeds by night, builds its nest on the ground, or in low bushes, in sea and river marshes.

It is mentioned in the Bible as inhabiting desolate places; and the Lord, in foretelling the destruction of Babylon, says, "I will also make it a possession for the *bittern*, and pools of water." When the American bittern is startled in the day-time by the too near approach of footsteps, it utters a hollow, guttural note; but it has not that loud booming sound for which the European bittern is so remarkable.

" While, scared by step so near,
Uprising from the sedgy brink
The lonely bittern's cry will sink
Upon the startled ear."—HOFFMAN.

7. Another bird of the heron family is the American crane, often called the *whooping crane*, on account of its loud, piercing cry, which may be heard at the distance of two miles.

" Vast clang is heard
Along the skies, when, from incessant showers
Escaping, and from winter's cold, the cranes
Take wing, and over ocean speed away."

The cranes migrate yearly from South America, and sometimes go as far north as the arctic circle; and in their immense journeyings they pass at so great a height in the air as to be seldom seen. Yet they are found scattered over all North America. They are extremely shy and vigilant, and it is with the greatest difficulty that they can be shot.

8. Audubon gives a ludicrous^s account of his fleeing from a crane, whose wing he had broken by a musket shot. After having pursued the wounded bird until it took refuge in a pile of drift-wood, he says: "As I approached it, panting and almost exhausted, it immediately reared itself to the full stretch of its body, legs, and neck, ruffled its feathers, shook them, and advanced toward me with open bill, and eyes glaring with anger. Perhaps it was because I was almost exhausted with fatigue; but I felt unwilling to encounter my antagonist, and, keeping my eye on him, moved backward.

9. "The farther I removed, the more he advanced, until at length I turned my back to him, and took to my heels, retreating with much more speed than I had pursued. He followed, and I was glad to reach the river, into which I plunged up to the neck, calling out to my boatmen, who came up as



fast as they could. The crane stood looking angrily on me all the time, immersed⁹ up to his belly in the water, and only a few yards distant, now and then making thrusts at me with his bill. There he

stood until the people came up, and highly delighted were they with my misfortune—discomfited¹⁰ by a bird! However, the battle was soon over; for, on landing, some of them struck the winged warrior on the neck with an oar, and we carried him on board.”

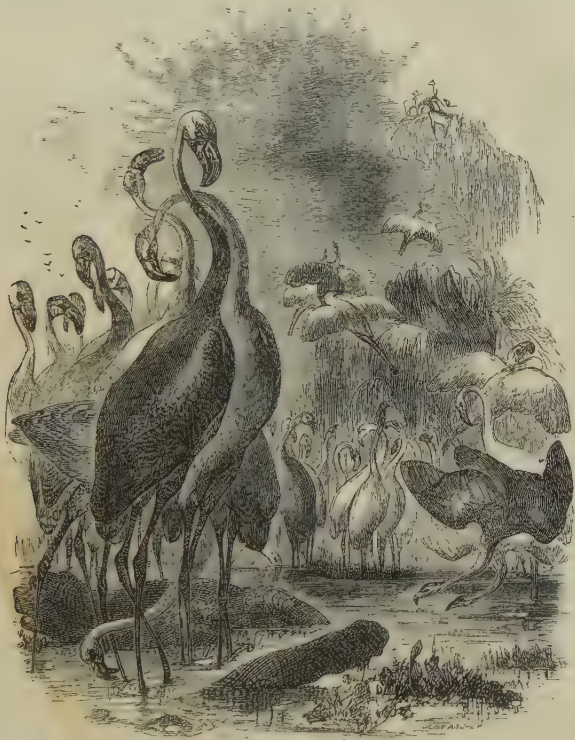
10. The spoonbills—so named on account of the peculiar form of the bill—have many characters in common with the herons, and are usually found associating with them. The ibises—of which the white or sacred ibis of Egypt is the most celebrated—more nearly resemble the storks. Several species of these birds are found in the United States, chiefly in the southern portions.

11. The snipes, which embrace a large family of birds, known by the common names of woodcocks, marlins, curlews, tattlers, stilts, avosets, ruffs, sandlarks, and sandpipers, are noted for the extreme length and slenderness of the beak. These birds frequent marshes, and the banks of lakes and rivers, on which they run with great swiftness. Their flesh is held in high esteem. In general form and habits the plovers and rails are nearly allied to the snipes. Many species of the rails, or water-hens, are found in Virginia and the Carolinas.

12. The flamingo, which has the neck and legs of greater proportionate length than any other bird, often measures six feet from the end of its claws to the tip of its bill. When in full plumage, which is not till the end of the third year, this bird is of a deep scarlet color, except the quills, which are black. The flamingo is abundant in Africa, and in South America and the West India Islands, and has been seen as far north as the neighborhood of Philadelphia. It piles up a hillock of mud, with a cavity¹¹ at the top, for its nest.

13. A flock of these birds, seen at a distance on the margin of a river, appears like a regiment of soldiers in brilliant

uniform. When they are feeding, one of them stands sentinel; and the moment he sounds the alarm, the whole flock take wing.



“And see where yonder stalks,¹² in crimson pride,
The tall flamingo by the river’s side—
Stalks, in his richest plumage bright arrayed,
With snowy neck superb, and legs of length’ning shade.”

BOWLES.

A-QUĀT'-IC, pertaining to water.

² SHĀLS, shallow places.

³ ĒBB'-ING, flowing back; the reflux.

⁴ SĀ'-TIĀ-TED, filled; glutted.

⁵ CŪN'-GRE-GĀTES, assembles.

⁶ HĀV'-OC, destruction.

⁷ NŌX'-IOUS, injurious.

⁸ LŪ'-DI-CROUS, laughable.

⁹ IM-MERS'ED, plunged in; covered.

¹⁰ DIS-CŌM'-FIT'-D, defeated; put to flight.

¹¹ CĀV'-I-TY, a hollow.

¹² STĀLKS, walks with proud step.

VII. THE SWIMMERS (*NATATORES*).

LESSON XXX.



1. Patagonian Penguin, *Aptenodytes Patagonica*. 2. Great Auk, *Alca impennis*. 3. Puffin, *Alca arctica*. 4. Brown Pelican, *Pelecanus fuscus*. 5. Black-backed Gull, *Larus fuscus*. 6. Darter, *Plotus anhinga*. 7. Albatross, *Diomedea exulans*. 8. Little Auk, *Alca alle*. 9. Crested Grebe, *Podiceps cornutus*. 10. Great Northern Diver, or Loon, *Columbus glacialis*. 11. Wild Swan, *Cygnus ferus*.

1. THE seventh and last order of birds embraces the large class of web-footed or swimming birds. As these birds move in an element which is every where essentially the same, whether beneath the tropics or beyond the polar circles, we find not only that there are, as among the land birds, particular kinds confined to different portions of the world, but that some species, such as the ducks, the gulls, and the petrels, encircle the entire globe.

2. Like the other orders, that of the swimmers also has been divided into several families, the several species in each bearing some striking resemblances to each other. Thus the swimmers are divided into the six families of the ducks, divers, auks, petrels, gulls, and pelicans. A common observer

might not readily see why they are divided into these particular groups or families, or why additional divisions might not just as well be made—why, for example, ducks, geese, and swans might not form three separate families as well as one.

3. But as some grouping into families is essential to a clear description of their forms and habits, the arrangement which is most convenient for this purpose should be adopted. Thus the *duck* family may be described as those swimming-birds that have thick and broad bills; and this description will include the various kinds of ducks, geese, and swans. The *divers* are described as having narrow, straight, and sharp-pointed bills, and as remaining a long time under water; and this description will apply to what are known as divers, grebes, and loons; and thus are made up the several families into which the swimmers are divided. Some similar arrangement has been adopted in all the other orders.



1. White-fronted Wild Goose, *Anas erythropus*. 2. Common Eider Duck, *Anas mollissima*. 3. Green-crested Cormorant, *Pelecanus cristatus*. 4. Red-throated Diver, *Colymbus septentrionalis*. 5. Common Shoveler-duck, *Anas chlypeata*. 6. Surf-duck, or Scoter, *Anas perspicillata*. 7. Solan Goose, or Gannet, *Pelecanus bassana*.

4. Of all the swimming-birds, the duck family, including ducks, geese, and swans, is the best known, as some species in each division have been domesticated. The vigilant habits of wild geese while feeding have been thus described:

“When they go forth to graze, with jealous care
They place a watch, which, with keen ear intent³
On coming danger, sounds its shrill note,
And warns the ready flock.”—SCHILLER.

5. The swan, which is a beautiful and majestic bird, has been glorified³ by the bards⁴ of all nations. Milton thus describes it:

“The swan, with arched neck
Between her white wings mantling⁵ proudly, rows
Her state⁶ with airy feet; yet oft they quit
The dank,⁷ and rising on swift pinions, tower
The mid aerial sky.”

According to nearly all the old poets, and some of the moderns, the swan pours forth its last breath in sublime and enchanting music. There is a fable that a stork, which listened to the song of a dying swan, told her it was contrary to nature to sing so much out of season, and asked her the reason of it. “Why,” said the swan, “I am now entering into a state where I shall be no longer in danger of either snares, guns, or hunger; and who would not rejoice at such a deliverance?”

6. Among the divers the largest and finest species is the great loon, which is frequently seen on inland lakes in this country, but is seldom shot, as it dives instantaneously at the flash of a gun, and then swims a great distance under water. The cry of the loon, which is melancholy in its tone, resembling the howling of the wolf, is said to portend⁸ rain.

7. The auks, which have their dreary homes on the frozen coasts and islands of the Northern Ocean, but from which they wander hundreds of miles out to sea, have generally small wings; but these they use as aids in diving and swimming. The great auk can not fly at all; but he climbs up the rocky cliffs, and is often seen on floating ice.

8. The puffin is another bird of the auk family; and in the southern hemisphere the same family is represented by the penguins, which are very singular-looking birds, having no wings nor proper feathers, but two fins or flippers, like the seal. These birds are found in immense flocks on the southern islands. On land they hop along in a very awkward manner, but they swim with great swiftness, and are often seen far out at sea.

9. The petrels, or fulmars, are eminently birds of the ocean, rarely approaching the land, some of them appearing to be almost constantly on the wing, and following the course of ships for days together without alighting. The common albatross, which belongs to this family, extends its wings far-

ther in flying than any other sea-bird known. When on the wing it is the very ideal⁹ of beauty; and it sits upon the water as light and graceful as a swan.

10. The gulls are a numerous and well-known family, dispersed over every quarter of the world. The terns or sea-swallows, the skimmer of the seas, and the gray, white, and black-backed gulls, are names by which some of the species are known. The family of the pelicans, which includes the cormorants, darters, frigate birds, the Solan goose or gannet, and the phaetons, closes the list of the sea-birds—and a numerous list it is. And what a degree of life they impart to the grand, gloomy, majestic, and otherwise solitary ocean!

11. And how strictly in accordance with the wild and gloomy grandeur of the scene are the habits of these birds, and the hardy lives they lead!

“Watchful and agile,¹⁰ uttering voices wild
And harsh, yet in accordance with the waves
Upon the beach, the winds in caverns moaning,
Or winds and waves abroad upon the water.
Some seek their food among the finny shoals,
Swift darting from the clouds, emerging soon
With slender captives glittering in their beaks;
These in recesses of steep crags construct
Their eyries¹¹ inaccessible, and train
Their hardy broods to forage¹² in all weathers.”

12. How cheering the presence of these birds is to the weary mariner, none but those who “go down upon the sea in ships” can tell. But in an economical relation, also, this order of birds is of considerable importance. To it we owe all our domesticated breeds of geese, ducks, etc.; from it our finest feathers and downs, employed as articles of luxury, or by the fair sex as dresses and adornments of ornamental comfort, are derived; and among northern nations the collection of the eggs and young of many wild species is an object of regular employment and commerce.

13. We have thus given a very brief account of the swimming-birds. In the preceding orders—in the birds of prey, the perchers, the climbers, the scratchers, the runners, the waders—we are constantly reminded of benevolent design in the wisdom which has created and arranged them, each in its

proper sphere, and all in beautiful harmony: and here again we find the same beautiful adaptation in the powers, instincts, and habits of these water-birds to the places they are designed to fill in the great chain of animated nature.

14. The swimmers are a large class of birds, and wide is the range which has been assigned them; for they not only throng¹³ on the line of the ocean, and frequent every bay and headland of its winding shores in every quarter of the globe, but wherever, in their lofty flights, the surface of an inland lake or river meets their view, remote from the dwellings of man, there also some of them cluster at certain seasons, either to feed, or to rear their young. Theirs are the wild solitudes of Nature—the ocean, the sandy coast, the solitary lake; and when driven from these for repose at night or shelter from the storm, rocky isles far in the ocean's void,¹⁴ and rocky shores difficult of access, are their resting-places.

15. While the waders have thin bodies, that they may make their way the more easily through the rank water-grass of the marshes which they frequent, those of the swimmers are broad and flat, to enable them the better to float on the surface of the water. The plumage of the swimming-birds is also remarkably thick and close, especially on the under parts of the body; the skin is covered with a dense¹⁵ coat of soft down; and the outer surface is polished and oily, thus effectually protecting their bodies from the water, while the feathers of all land-birds, on the contrary, are quickly saturated¹⁶ by it. The air is, indeed, made the common element of both classes; but the one is so formed as best to obtain its support on the water, the other on the land: each element furnishes the food appropriate¹⁷ for its own tenants;¹⁸ and thus every part of nature teems¹⁹ with happy, joyous life.

1 EN-CIR'ELE, surround.

2 IN-TENT', listening with watchful anxiety.

3 GLÓ'-RI-FIED, honored; dignified.

4 BĀRDS, poets.

5 MĀN'-TLING, spreading (referring to the wings).

6 "HER state," her dignity; dignified self.

7 DĀNK, moist; here used for the water.

8 POR-TEND', foreshow; indicate.

9 Ī-DE'-AL, model of perfection.

10 AG'-ILE, quick in motion; active.

11 EY'-RIES (*ô'-res*), places where birds of prey build their nests and hatch.

12 FOR'-AGE, go forth to collect their food.

13 THŒNG, are abundant.

14 VOID, empty space.

15 DENSE, close; thick.

16 SĀT'-Ī-RĀ-TED, completely filled.

17 AP-PRŌ'-PRI-ATE, suitable.

18 TĒN'-ANTS, inhabitants.

19 TEEMS, abounds.

LESSON XXXI.

THE HARMONY OF NATURE.

"The wood, the mountain, and the barren waste, the craggy rock, the river, and the lake, are never searched in vain; each has its peculiar inhabitants, that enliven the scene and please the philosophic eye."—MONTAGUE.

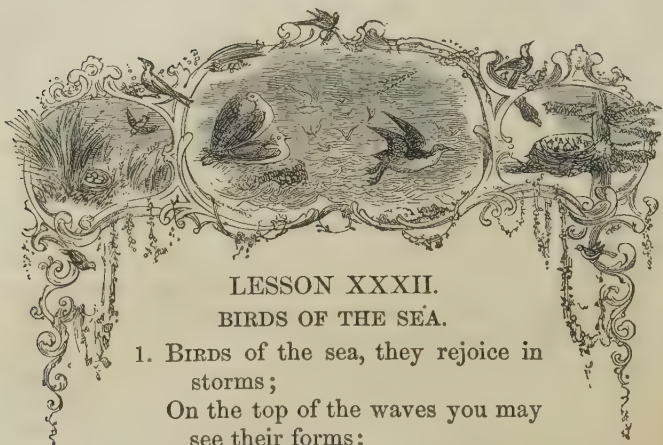
1. IN full accordance with the sentiments of the author we have quoted above, we have often wandered in the recesses of our woods and the passes of far-stretching and craggy mountains, searched around our wild or beautiful lakes and our precipitous sea-coasts, and we have never been disappointed.

2. If we did not always meet with some species new to our collection, we found fresh facts to record of those we already possessed; and we delighted in the landscape enlivened by the airy creatures whose structure we had been examining, and whose habits we could there survey so freely. What would be the landscape without its living inhabitants? The luxuriance of vegetation, varying with beautiful flowers and rich foliage, has indeed charms quiet and seducing, but not such as fully satisfy the mind.

3. In the depth of the forest, or on the mountain's top, ere break of day had awakened their various tenants, and in some of our beautiful mornings of mid-year, we have seen how deeply tinted seemed the green of the foliage, and how chaste and blended were the tints on the nearly barren rock; how lovely the sylvan flowers appeared, showing their freshest blossoms amid the soft and matted growth beneath, and how exquisite the structure of the moss or lichen within our reach; how calm, clear, and serene the air, how deep the shadows; but how complete the quiet, how still the silence!

4. There is something in the gradual change from darkness to daylight in places such as these, which, while it is pleasing and agreeable to witness, leaves a deep and impressive feeling as of something wanting, not to be dispelled by the richest or most attractive vegetation. Soon, however, the stillness is broken, the various creatures go to their usual occupations, the scene is at once enlivened, the void is filled, and the harmony of Nature is complete.

SIR WM. JARDINE.



LESSON XXXII.
BIRDS OF THE SEA.

1. BIRDS of the sea, they rejoice in
storms ;
On the top of the waves you may
see their forms ;

They run and dive, and they whirl and fly,
Where the glittering foam-spray breaks on high ;
And against the force of the strongest gale,
Like phantom¹ ships, they soar and sail. PARK BENJAMIN.

2. High o'er the restless deep, above the reach
Of gunner's hopes, vast flocks of wild ducks stretch ;²
Far as the eye can glance on either side,
In a broad space and level line they glide ;
All in their wedge-like figures from the north,
Day after day, flight after flight, go forth.

3. In-shore their passage tribes of seagulls urge,³
And drop for prey within the sweeping surge ;
Oft in the rough opposing blast they fly
Far back, then turn, and all their force apply,
While to the storm they give their weak complaining cry,
Or clap the sleek white pinion to the breast,
And in the restless ocean dip for rest. CRABBE.

¹ PHAN'-TOM, unreal ; existing in appearance only.

² STRETCH, sail away in long lines.

³ URGE, push their way.

LESSON XXXIII.

THE STORMY PETREL (*Procellaria Pelagica*).

1. THIS is the bird that sweeps over the sea—
 Fearless, and rapid, and strong is he;
 He never forsakes the billowy roar
 To dwell in calm on the tranquil shore,
 Save when his mate, from the tempest's shocks,
 Protects her young in the splintered rocks.
2. Up and down! up and down!
 From the base of the wave to the billow's crown,
 And amidst the flashing and feathery foam,
 The Stormy Petrel finds a home—
 A home, if such a place may be,
 For her who lives on the wide, wide sea,
 On the craggy ice, in the frozen air,
 And only seeketh her rocky lair¹.
 To warm her young, and teach them to spring
 At once o'er the waves on their stormy wing!
3. All over the ocean, far from land,
 Where the storm-king rises, dark and grand,

The mariner² sees the Petrel meet
 The fathomless³ waves with steady feet,
 And a tireless wing, and a dauntless⁴ breast,
 Without a home or a hope of rest.

4. O'er the deep! o'er the deep!
 Where the whale, and the shark, and the swordfish sleep:
 Outflying the blast and the driving rain,
 The Petrel telleth her tale—in vain;
 For the mariner curseth the warning bird,
 Which bringeth him news of the storm unheard!
 Ah! thus does the prophet of good or ill
 Meet hate from the creatures he serveth still:
 Yet *he* never falters: so, Petrel, spring
 Once more o'er the waves on thy stormy wing!
5. So, 'mid the contest and toil of life,
 My soul, when the billows of rage and strife
 Are tossing high, and the heavenly blue
 Is shrouded⁵ by vapors of sombre⁶ hue—
 Like the Petrel, wheeling o'er foam and spray,
 Onward and upward pursue thy way!

¹ LAIR, resting-place.

² MĀR'-I-NER, seaman; a sailor.

³ FĀTH'-OM-LESS, the depth of which can not be measured.

⁴ DĀUNT'-LESS, bold; fearless.

⁵ SHROUD'-ED, covered; concealed.

⁶ SŌM'-BRE, dull; cloudy; gloomy.

NOTE.—The first, third, and fifth verses of the foregoing are by Park Benjamin, and the second and fourth by B. W. Proctor. The several changes in *metre* render it a difficult but useful reading exercise.

LESSON XXXIV.

TO A WATER-FOWL.

1. WHITHER, midst falling dew,
 While glow the heavens with the last steps of day,
 Far, through the rosy depths, dost thou pursue
 Thy solitary way?
2. Vainly the fowler's¹ eye
 Might mark thy distant flight to do thee wrong,
 As, darkly painted on the crimson sky,
 Thy figure floats along.

3. Seek'st thou the flashy² brink
Of weedy lake, or marge³ of river wide,
Or where the rocky billows rise and sink
On the chafed⁴ ocean's side?
4. There is a Power whose care
Teaches thy way along that pathless coast—
The desert and illimitable⁵ air—
Lone wandering, but not lost.
5. All day thy wings have fanned,
At that far height, the cold, thin atmosphere;
Yet stoop not, weary, to the welcome land,
Though the dark night is near.
6. And soon that toil shall end;
Soon shalt thou find a summer, home, and rest,
And scream among thy fellows; reeds shall bend
Soon o'er thy sheltered nest.
7. Thou'rt gone! the abyss⁶ of heaven
Hath swallowed up thy form; yet, on my heart
Deeply has sunk the lesson thou hast given,
And shall not soon depart.
8. He who, from zone to zone,
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone
Will lead my steps aright.

BRYANT.

¹ FOWL'-ER, one who hunts wild fowls.² PLĀSH'-Y, watery.³ MĀRGE, for margin.⁴ CHĀFED, worn by the waves.⁵ IL-LĪM'-IT-A-BLE, boundless.⁶ A-BYSS', boundless space.

BIRDS OF PASSAGE BY NIGHT.

I hear the beat of their pinions fleet,
As from the land of snow and sleet
They seek a southern sea:
I hear the cry of their voices high,
Falling dreamily through the sky,
But their forms I can not see.

LONGFELLOW.

LESSON XXXV.

WHAT IS THAT, MOTHER?



1. "WHAT is that, mother?"

"The lark, my child ;
The morn has but just looked out and smiled,
When he starts from his humble, grassy nest,
And is up and away, with the dew on his breast,
And a hymn in his heart, to yon pure, bright sphere,
To warble it out in his Maker's ear.
Ever, my child, be thy morn's first lays
Tuned, like the lark's, to thy Maker's praise."



2. "What is that, mother?"

"The dove, my son ;
And that low, sweet voice, like the widow's moan,
Is flowing out from her gentle breast,
Constant and pure, by that lonely nest,
As the wave is poured from some crystal urn,
For her distant dear one's quick return.
Ever, my son, be thou like the dove ;
In friendship as faithful, as constant in love."



3. "What is that, mother?"

"The eagle, my boy,
Proudly careering his course of joy ;
Firm, on his own mountain vigor relying ;
Breasting the dark storm ; the red bolt defying :
His wing on the wind, and his eye on the sun,
He swerves not a hair, but bears onward, right on.

Boy, may the eagle's flight ever be thine,
Onward, and upward, and true to the line."



4. "What is that, mother?"

"The swan, my love.

He is floating down from his native grove;
No loved one now, no nestling nigh;
He is floating down, by himself, to die.
Death darkens his eye, and unplumes his wings;
Yet his sweetest song is the last he sings.
Live so, my love, that when death shall come,
Swanlike and sweet it may waft thee home."

LOANE.

LESSON XXXVI.

THE BIRDS OF HEAVEN.

1. HARK to Nature's lesson, given
By the blessed birds of heaven!
Every bush and tufted tree
Warbles sweet philosophy:
"Mortal', fly from doubt and sorrow';
God provideth for the morrow.
2. "Say', have kings more wholesome fare
Than we, poor citizens of air'?
Barns nor hoarded grain have we,
Yet we carol merrily.
Mortal', fly from doubt and sorrow;
God provideth for the morrow.
3. "One there lives, who, Lord of all,
Keeps our feathers lest they fall':
Pass we blithely, then, the time,
Fearless of the snare and lime,
Free from doubt and faithless sorrow:
God provideth for the morrow."

BISHOP HEBER.

XXXVII. QUESTIONS TO THE BIRDS, AND THEIR ANSWERS.

1. THE EAGLE.



ART thou the king of birds, proud eagle'? Say!
 "I am'; my talons and my beak bear sway';
 A greater king than I if thou wouldst be',
 Govern thy tongue, but let thy thoughts be free."

2. VULTURES.



Abominable harpies'! spare the dead'!
 "We only clear the field which man has spread;
 On which should Heaven its hottest vengeance rain'?
 You slay the living—we but strip the slain."

3. THE OWL.



Blar-eyed,² strange-voiced, sharp-beaked, ill-omened fowl',
 What art thou'? "What I ought to be—an owl;
 But if I'm such a scarecrow³ in *your* eye,
 You're a much greater fright in mine—good-by!"

4. THE SWALLOW.



[wing'?
 Swallow', why homeward turned thy joyful
 "In a far land I heard the voice of Spring;
 I found myself that moment on the way;
 My wings, my wings, they had not power to stay."

5. THE CANARY.

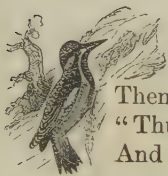


Dost thou not languish⁴ for thy father-land',
 Madeira's fragrant woods and billowy strand'?⁵
 "My cage is father-land enough for me;
 Your parlor all the world—sky, earth, and sea."

6. THE HUMMING-BIRD.



Art thou a bird', or bee', or butterfly'?
 "Each, and all three. A bird in shape am I;
 A bee, collecting sweets from bloom to bloom;
 A butterfly in brilliancy of plume."



7. THE WOODPECKER.

Rap, rap—rap, rap—I hear thy knocking bill,
Then thy strange outcry, when the woods are still
“Thus am I ever laboring for my bread,
And thus give thanks to find my table spread.”



8. THE PARROT.

Parrot', why hast thou learned by rote⁶ to speak
Words without meaning through thy uncouth beak'?
“Words have I learned'? and without meaning too'?
No wonder, sir—for I was taught by yóu'.”

9. CHANTICLEER.



[count'?]
Who taught thee, Chanticleer, the time to
“Learn from my voice Time's worth and its amount.
Long before wheels and bells had learned to chime,⁷
I told the steps unseen, unheard, of Time.”

10. THE PHEASANT.



[town';]
Pheasant', forsake the country', come to
I'll warrant thee a place beneath the crown.
“No; not to roost upon the throne, would I
Renounce the woods, the mountains, and the sky.”

11. THE STORK.



[thee'?]
Stork', why were human virtues given to
“That human beings might resemble me:
Kind to my offspring, to my partner true,
And duteous to my parents—what are you?”

12. ROBIN AND SPARROW.



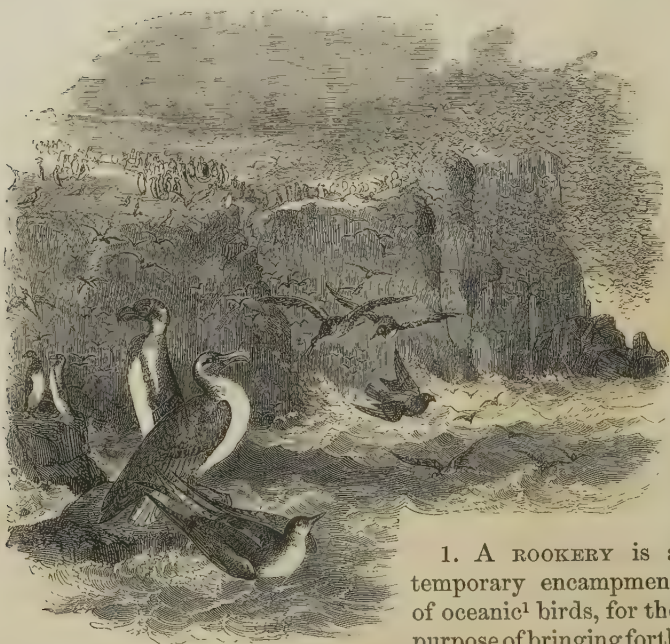
Familiar warbler', wherefore art thou come'?
“To sing to thee when all beside are dumb;
Pray let the little children drop a crumb.”
Sparrow', the gun is leveled;⁸ quit that wall!
“Without the will of Heaven I can not fall.”

JAMES MONTGOMERY.

¹ HAR'-PIES, plunderers.² BLEAR'-EYED, dim-sighted.³ SCARE'-CROW, a frightful thing.⁴ LÂN'-GUISH, pine; lose animation.⁵ STRĀND, shore of the ocean. [meaning.]⁶ RÔTE, repetition without attending to the⁷ CHIME, agree; harmonize.⁸ LĒV'-ELED, aimed.

LESSON XXXVIII.

A SOUTH SEA ROOKERY (MORRELL).



1. A ROOKERY is a temporary encampment of oceanic¹ birds, for the purpose of bringing forth

their young; and they unite in immense numbers, and with great industry, to construct it. When a sufficient number of penguins, albatrosses, etc., are assembled on the shore, they appear to hold a deliberate consultation, and then proceed to the execution of the grand purpose for which they left their favorite element.

2. In the first place, they carefully select a level piece of ground, of suitable extent, and as near the water as practicable, always preferring that which is the least encumbered² with stones and other hard substances, with which it would be dangerous to have their eggs come in contact. As soon

as they are satisfied on this point, they proceed to lay out the plan of their projected³ encampment, which task they commence by tracing a well-defined parallelogram,⁴ of sufficient magnitude to accommodate the whole fraternity, and often containing several acres.

3. One side of this encampment runs parallel with the water's edge, and is always left open; the other three sides are differently arranged. These industrious feathered laborers next proceed to clear all the ground within the limits from obstructions of every kind, picking up the stones in their bills, and carefully depositing them outside of the lines, until they sometimes, by this means, create quite a wall on three sides of the rookery.

4. Within this range of stones and rubbish they form a pathway six or eight feet in width, and as smooth as any of the paved or graveled walks in the New York Park or on the Battery. This path is for a general promenade⁵ by day, and for the sentinel to patrol⁶ by night.

5. Having thus finished their little works of defense on the three land sides, they next lay out the whole encampment in little squares of equal size, forming narrow paths, which cross each other at right angles, and which are also very smooth. At each intersection⁷ of these paths an albatross constructs her nest, while in the centre of each little square is a penguin's nest; so that each albatross is surrounded by four penguins, and each penguin has an albatross for its neighbor in four directions.

6. In this regular manner is the whole space occupied by these feathered sojourners of different species—leaving, at convenient distances, accommodations for some other kinds of oceanic birds, such as the shag, or the green cormorant, and another which the seamen call *Nelly*. Although the penguin and the albatross are on such intimate terms, and appear to be so affectionately and sincerely attached to each other, they not only form their nests in a very different manner, but the penguin will even rob her friend's nest whenever she has an opportunity.

7. The penguin's nest is merely a slight excavation⁸ in the earth, just deep enough to prevent her single egg from roll-

ing away; while the albatross throws up a little mound of earth, grass, and shells, eight or ten inches high, and about the size of a water-bucket, on the summit of which she forms her nest, and thus looks down upon her nearest neighbors and best friends.

8. None of the nests of these rookeries are ever left unoccupied for a single moment until the eggs are hatched and the young ones old enough to take care of themselves, for the females are so ambitious of producing a large family, that they rob each other whenever they have an opportunity.

9. The royal penguin is commonly foremost in felonies⁹ of this description, and never neglects an opportunity of robbing her neighbor. Indeed, it often happens that, when the period of incubation is terminated, the young brood will consist of three or four different kinds of birds in one nest. This is strong circumstantial evidence that the parent bird is no more honest than her neighbors.


10. To stand at a distance, and observe the birds in these rookeries, is not only amusing, but edifying¹⁰ and affecting. The spectacle is truly worthy the contemplation¹¹ of a philosophic mind. You will see them marching round the encampment in the outside path, or public promenade, in pairs, or in parties of four, six, or eight, forcibly reminding you of officers and soldiers on a parade-day. At the same time, the camp or rookery is in continual motion, some penguins passing through the different paths or alleys on their return from an aquatic excursion, eager to caress their mates after a temporary absence, while the latter are passing out, in their turn, in quest of refreshment and recreation.

11. At the same time the air is almost darkened with an immense number of the albatrosses hovering over the rookery like a dense cloud, some continually lighting and meeting their companions, while others are constantly rising and shaping their course toward the sea.

¹ O-CE-ÄN'-IC (*o-she-än'-ik*), pertaining to the ocean, or great sea.

² EN-EŪM'-BERED, filled up; obstructed.

³ PRO-JĒCT'-ED, devised; determined upon.

⁴ PÄR-AL-LĒL'-O-GRAM, a four-sided figure of more length than breadth. 

⁵ PROM-E-NÄDE', a place for walking.

⁶ PA-TRÖL', to march about, and observe what passes.

⁷ IN-TER-SĒC'-TION, crossing.

⁸ EX-CA-VÄ'-TION, hollow.

⁹ FĒL'-O-NIES, thefts; stealing.

¹⁰ ĒD'-I-FĒ-ING, instructive.

¹¹ CON-TĒM-PLÄ'-TION, meditation; study.

PART III.

FIRST DIVISION OF VEGETABLE PHYSIOLOGY,
OR BOTANY.*

(THIS SUBJECT IS CONTINUED IN THE FIFTH READER.)



LESSON I.

THE VEGETABLE KINGDOM.

1. THE first notice we have of that part of the world around us which bears the name of the vegetable kingdom, is in the first chapter of the Bible, where we are told that on the third day of the creation God said, "Let the earth bring forth grass, the herb yielding seed, and the fruit-tree yielding fruit after his kind, whose seed is in itself upon the earth."

* The science of BOTANY, so called from the Greek word *botane* (*βοτανή*), a plant, has been divided by botanists into three parts: 1st. ORGANOGRAPHY, which treats of the structure or anatomy of plants; 2d. VEGETABLE PHYSIOLOGY, which treats of the functions of their several parts—the way a plant lives and grows, etc.; and, 3d. DESCRIPTIVE BOTANY, which treats of the classification of plants, their geographical distribution, and the general characteristics of the most important vegetable productions.

2. At the command of the Almighty the mysteries of vegetable life began to start into being; shrubs and flowers adorned the fields, lofty trees waved in the forests, and herbs and grasses covered the ground with verdure.¹ It was only after the earth had thus been robed in beauty that it brought forth abundantly "cattle and creeping things," and "every living creature after its kind." Thus vegetables rank first in order in the scale of creation. Being designed for the support of animal life, they are universally diffused² over our globe—throughout the extremes of heat and cold—even in the waters of the sea as well as on the land.

3. Wherever the eye is directed it encounters an infinite multitude of the most dissimilar forms of vegetation. Some are cast ashore by the waters of the sea in the shape of leathery straps or thongs, or are collected in ocean meadows of vast extent; others crawl out of the crevices of dank³ and loathsome mines, where the light of day never penetrates; in rivers and tranquil waters are found living threads of green; mud throws up its jelly-like scum; filthy dregs of all kinds bring forth their living brood of microscopic⁴ plants; corn crops change to fetid⁵ soot; rust and mildew blight our grains; and all matter in decay is seen to teem⁶ with mouldy life. All these forms belong to the lower orders of the vegetable world.

4. If we rise higher in the scale, this never-ending diversity opens a world of beauty to our view. The bark of ancient trees is covered with velvet; their branches are hung with a gray-beard tapestry;⁷ and grandeur and gloom overspread the forest world. The scene changes in the more open landscape. There heaths and moors wave with a tough and wiry herbage; meadows are clothed with an emerald⁸ mantle, amid which spring up flowers of all hues and forms; bushes throw abroad their many-fashioned foliage, and twining vines scramble over and choke them.

5. The individual forms of vegetation also change at every step. With every altered condition and circumstance new plants start up. The mountain side has its own races of vegetable inhabitants, and the valleys have theirs; the tribes of the sand, the granite, and the limestone are all different; and

the sun does not shine upon two degrees on the surface of this globe, the vegetation of which is identical,⁹ for every latitude has a flora¹⁰ of its own. In short, the forms of seas, lakes, and rivers, islands and peninsulas, hills, valleys, plains, and mountains, are not so infinitely diversified¹¹ as the vegetation which adorns them.

6. In all ages of the world, flowers, the crowning glory of plants, have been especially regarded as things of beauty, and emblems of innocence and virtue. Many of the finest poetical images in all languages are drawn from them. Our Lord alludes to the "lilies of the field," to convince his people of God's care for them. He says, "Consider the lilies of the field, how they grow: they toil not, neither do they spin; and yet I say unto you that Solomon, in all his glory, was not arrayed like one of these. Wherefore, if God so clothe the grass of the field, which to-day is, and to-morrow is cast into the oven, shall he not much more clothe you, O ye of little faith?"

7. That eminent American botanist, Professor Gray, in quoting this passage, remarks, "When Christ himself directs us to consider with attention the plants around us—to notice how they grow—how varied, how numerous, and how elegant they are, and with what exquisite skill they are fashioned and adorned, we shall surely find it profitable and pleasant to learn the lessons which they teach."

8. "Thou wert not, Solomon! in all thy glory,
Arrayed, the lilies cry, in robes like ours;
How vain your grandeur! Ah! how transitory!¹²
Are human flowers!"—HORACE SMITH.

"Whate'er man finds
Of flavor or of scent in fruit or flower,
Or what he views of beautiful or grand
In nature, from the broad majestic oak
To the green blade that twinkles in the sun,
Prompts¹³ with remembrance of a present God."—COWPER.

¹ VÉRD'-ÛRE, greenness; vegetation.

² DIF-FÛSED', spread abroad.

³ DĀNK, damp; moist.

⁴ MĪ-CRO-SĒŌP'-IC, very small.

⁵ FĒT'-ID, rank; offensive to the smell.

⁶ TEEM, abound.

⁷ TĀP'-ES-TRY, woven hangings for walls.

⁸ ĚM'-E-EALD, bright green.

⁹ Ī-DĒN'-TI-CAL, the same; not different.

¹⁰ FLŌ'-RA, a collection of trees and plants of a particular country.

¹¹ DĪ-YĒ'-SI-FIED, varied.

¹² TRĀN'-SI-TO-RY, passing away quickly.

¹³ PRŌMPTS, suggests; reminds.

LESSON II.

INTRODUCTORY VIEW OF BOTANY.

Fig. 1.



Fir-trees.
Poplar.
Morning-glory.

OAK.

Willow.

EX-OG'-EN-OUS PLANTS.

DATE-PALM. Banana.
False Sago Palm (Cycas).
Indian Corn.

EN-DOG'-EN-OUS PLANTS.

1. "How can children gain a knowledge of botany'? Can not the difficulties which are said to accompany the study of this branch of science be, by some little contrivance, either removed altogether or very much diminished'? Allow me, in answer to this question, to repeat a fable which I remember to have read in some French author.

2. "A lady, observing some ants traveling across a table, dropped a lump of sugar in the midst of them; but, to her surprise, although ants are noted sugar-eaters, they all retreated in terror from the spot, nor could any of them afterward find courage to return to examine the object of their dread; on the contrary, they chose another track, and carefully avoided that which would have proved a treasure had they known its value.

3. "Struck by this occurrence, the lady placed the same piece of sugar on a part of the table near which the ants were in the habit of crossing, and, when she saw one of them approaching it, she gently placed her finger in his way, so as to obstruct his passage without alarming him. The ant paused, looked around him, and then took a new direction, not exactly toward the sugar, but near it.

4. "The lady again opposed his passage gently, and at last, by making him take a sort of zigzag¹ direction, as it were, at every few steps, the ant was unconsciously² brought to the sugar without being frightened. Once there, he examined the glittering rock attentively, touched it cautiously, broke off a morsel, and hastened away with it to the ant-hill, whence he presently returned at the head of a host of his comrades, by whom the rest of the sugar was quickly carried off.

5. "So it is with the science of Botany, and the young who have to acquire a knowledge of it. Let them be once alarmed at the aspect³ of their new pursuit, and it is almost impossible to restore their confidence; but there are few who, if led to it insensibly, will not persevere until they have made themselves masters of the subject."

6. Such are the remarks by which an eminent English botanist, Dr. Lindley, introduces one of his valuable works to the beginner in botanical studies. Like him, we would imitate the discretion of the lady in the fable; and, as we would not wish to frighten our youthful readers at the outset, we shall not build up a hedge of technical⁴ terms for them to climb over before they can enter the field to which we invite them.

7. At the beginning of this lesson we have given an engraving of an oak-tree, the pride of American forests, and a date-palm, a native of tropical climes, each surrounded by its kindred species of vegetation. The contrast⁵ of the widely-different forms of the oak and the palm, and of the seeds from which they sprung, shall serve as the basis on which to construct our first lesson in botany, and for pointing out the two great divisions of the vegetable world. In the following language Mrs. Howitt has very prettily described the "sprouting oak-tree:"

“The oak-tree was an acorn once, that fell upon the earth;
And sun and showers nourished it, and gave the oak-tree birth;
The little sprouting oak-tree! *two leaves* it had at first,
Till sun and showers nourished it, then out the branches burst.”

8. The oak-tree and the date-palm, different as they are in structure and appearance, are not more unlike than the *acorn* and the *date seed*. The most careless observer must have noticed the difference between a bean or pea and a kernel of wheat or corn, as well as in the leaves and stems of the plants themselves. Acorns, beans, and peas are easily split or divided into their two lobes;⁶ while the date seeds and grains of wheat and corn seem to consist of a single mass, which is with more difficulty split or broken.

9. The more careful observer has noticed that the stem, leaves, and external covering of plants growing from two-lobed or two-parted seeds differ from the corresponding parts of those springing from undivided seeds. The two-lobed seeds produce at first *two* seed-leaves; a stem grows up that has a woody structure, surrounded by a softer covering or bark, and the leaves are furnished with veins extending in different directions, and presenting a net-like appearance.

10. Such are found in the oak, the maple, the pines, and other fir-trees—in all the common trees of northern forests—and also in the bean, the pea, and the morning-glory. The undivided seeds, on the contrary, produce a *single* leaf at first; a stem grows up that has a reed-like arrangement, without bark or soft external covering, and the leaves have parallel veins. This kind of vegetable growth may be seen in a palm-stem, a ratan,⁷ a corn-stalk, and in different kinds of grain and the grasses.

11. Plants of the first division are what botanists call *exogenous*,⁸ or outward-growing, because they grow by additions to their outward surface, while the older and harder portions are the central parts. Those of the second division are called *endogenous*,⁹ or inward-growing, because they grow by internal additions, which constantly push the older and harder portions outward. Thus the outward portion of our forest trees—the sap-wood—is the softest; but the outward portion of the sugar-cane, or of a corn-stalk, is the hardest.

12. Those who have taken this first step in botany will now be able to divide plants, trees, shrubs, and flowering plants generally, into their two leading classes, from the structure¹⁰ of their stems, bark, and leaves. They will see that it requires no "mystical lore"¹¹ to give a partial description of a tree, shrub, or herb, from the examination of a single seed. There is no difficulty in understanding this, yet it constitutes one of the most important lessons in botany.

13. Let us then enter, without hesitation, upon this interesting science, that we may gain a knowledge of PLANTS, in respect to their organization,¹² their growth, and the properties¹³ and characteristics¹⁴ by which they are classified and distinguished. It is a science in which Solomon delighted; for he wrote about plants, "from the cedar-tree that is in Lebanon, even unto the hyssop that springeth out of the wall."

"The vegetable world, each plant and tree,
Its seed, its name, its nature, its degree,
He was allowed, as Fame reports, to know;
From the fair cedar on the craggy brow
Of Lebanon, nodding supremely tall,
To creeping moss, and hyssop on the wall."

14. Botany, moreover, is a science that will create for us a new world of life, teeming¹⁵ with ever-varying forms of beauty; it will present strange mysteries in the most common objects around us; and it will unfold¹⁶ many lessons of the "wisdom of God in creation." It will furnish us instructive companions wherever we are; and whether we wander by the road-side, in meadows and gardens, or on mountains, it will open to us the great volume of NATURE—a volume written "in the only language which has gone forth to the ends of the world, unaffected by the confusion of Babel."

¹ ZĪG'-ZAG, having frequent short turns.

² UN-CŌN'-SCIOUS-LY, without knowledge.

³ ĀS'-PECT, appearance.

⁴ TĒCH'-NIC-AL, such as belong to some art or profession; not common.

⁵ CŌN'-TRAST, different or opposite appearances.

⁶ LŌBES, parts; natural divisions.

⁷ RAT-ĀN', a species of cane with joints, but without branches.

⁸ EX-ŌG'-E-NOUS, outward-growing.

⁹ EN-DŌG'-E-NOUS, inward-growing.

¹⁰ STRŪCT'-ŪRE, internal formation.

¹¹ "MYSTICAL LORE," secret or obscure learning.

¹² OR-GAN-I-ZĀ'-TION, structure; arrangement of parts.

¹³ PRŌP'-ER-TIES, peculiar qualities.

¹⁴ CHAR-AC-TER-ĪS'-TICS, whatever marks or denotes the qualities of a thing.

¹⁵ TEEM'-ING, abounding.

¹⁶ UN-FŌLD', discover; display.

LESSON III.

THE ELEMENTARY PARTS OF PLANTS.—CELL LIFE.

1. ALL plants, from the gigantic cypress-trees of California to the microscopic vegetation growing as mould on bread, or mildew on articles of clothing, consist of separate and minute sacs, usually adherent¹ together, and called *cells*. The first thing we can detect, as a seed begins to form in the living plant, is a little cell, much smaller than the point of the finest needle, and visible only by the aid of the microscope. Gradually this little cell grows; then it divides into two, or another little cell is added to it; soon more cells are added; and by the time the growing seed is large enough to be seen by the naked eye, it consists of a cluster or mass of these little cells adhering together. (Fig. 2.)

2. After increasing in number for some time in this way, some of these clusters grow into the form of a leaf, and others into the form of a little root. Some, however, have *two* seed leaves, and some have only *one*, thus early marking out the two great classes of vegetable growth which we have already described. Thus, in the very seed itself, the germ² of the future plant lies hidden; even there the giant oak lies wrapped up in its little acorn cradle, a small thing then, yet destined to be not only the monarch of the woods, but the father of mighty forests yet to cover the earth.

3. Such are the wonders—the mighty results—which flow from so small a thing as a single seed. And may it not be that the Almighty formed but *one* acorn at the time of creation, and that in its little germ—even in its central cell—he folded up—so small that none but Omniscience³ could see it

Fig. 2.—The process of cell growth is here illustrated. At 1 is shown a highly magnified cell, as first seen by the microscope. The minute germ increases by the addition of other cells, until, in 6 and 7, the outlines of a leaf are visible.



—the oak which was to grow from it, and all the acorn seeds which it was to produce; and in those acorn seeds all the vast forests of oak that have since covered the earth? and that in a single grain of wheat he folded up, in miniature,⁴ the myriads⁵ of wheat plants which man has gathered in all succeeding harvests?

4. “Lo! in each seed, within its slender rind,⁶
Life's golden threads in endless circles wind—
Maze⁷ within maze the lucid webs⁸ are roll'd,
And, as they burst, the living flame unfold.
The pulpy acorn, ere it swells, contains
The oak's vast branches in its milky veins;
Grain within grain successive harvests dwell,
And boundless forests slumber in a shell.”

5. As cell life is the beginning of the life of plants, even in the seeds, so the entire growth of plants is but a continuation of the same process⁹—consisting of millions upon millions of little cells heaped together—forming alike the massive trunk of the oak, and the finest down upon the tiny leaf. When we consider the exceeding minuteness of these cells in some plants, and that some stems shoot up three or four inches in a day, we can form some idea of the wonderful rapidity of cell growth. It is supposed that the century plant, a short time before blooming, increases at the rate of over twenty thousand millions of cells in a day!

6. Thus, knowing how all vegetables grow, we can better understand the nature of such curious plants as mould, mildew, and yeast, which, having neither stems nor leaves, consist wholly either of a single cell, or of clusters of little cells adhering together. *Yeast*, which is put into the dough of bread to make it light, consists of little cell plants so exceedingly small that a cubic inch of yeast is said to contain more than eleven hundred millions of them. As the yeast plant grows rapidly in the dough, spreading all through it, and forming its living cells in countless numbers, it gives off little bubbles of gas, which puff up the dough, and thus “*leaven the whole lump*.”

7. Strange though it may seem, yet all animal growth is the growth of *cells* also, the same as in vegetables. The

muscles, the bones, the nerves, the hair, the nails, consist of cells. The smallest muscular fibre that the microscope can detect is made up of a row of little cells, much like a string of beads. In shape and mode of growth the animal cells are in all respects like the vegetable; but the substances of which they are composed are different.*

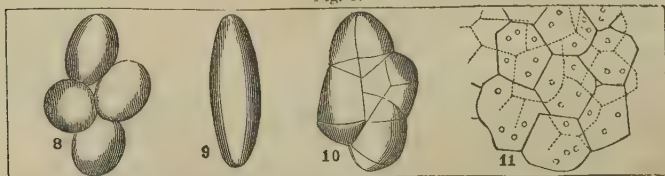
8. In very young plants, and also in the lower grades of vegetable life, such as the mushrooms and the mosses, the walls of the cells are very thin; and these are what are called *cellular* plants. These cells, when first formed, are egg-shaped, or globular, and filled with a liquid substance; but when numbers of them are pressed together in the growing plant they assume various forms, as may be seen by examining thin slices of the pith of different kinds of wood with a microscope. (Fig. 3.)

9. The cells are usually soft; but sometimes they are so filled up and pressed together that they become very hard, as in thorns, prickles, and the shells or coverings of nuts. Potatoes, turnips, and other vegetables are made palatable and digestible by breaking up their cells, containing starch and sugar, in the process of boiling or steaming.

10. Some of the cells, at an early stage of their growth, lengthen into the form of short tubes, and thicken their walls. These form what is called, from their shape, *vascular* tissue,¹⁰ or woody fibre. Owing to the strength of this tissue, vascular plants grow to a great height, with sufficient firmness to form the ribs of oak that plow the main, or, towering in their native woods like "the mast of some tall admiral," they are

* The cell walls of plants are composed of what is called *cellu-lu-lose*; but animal cells are composed of an animal element called *prō-te-ine*.

Fig. 3.



At 8, in Fig. 3, is shown a cluster of highly-magnified cells, of globular shape, as first formed. At 9 is a lengthened cell, the beginning of such as are found in vascular tissue. At 10 and 11 are globular cells assuming angular forms under the influence of pressure.

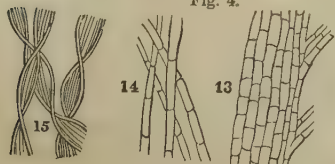
enabled to withstand the tempest's shock. Vascular tissue is sometimes in the form of spiral fibre, which may be seen surrounding the pith of some plants, where the thread may easily be uncoiled.

11. Through the small tubular wood-cells the sap is carried from the roots to the leaves. Yet these cells, in the young and growing plant, have no openings, and the sap can pass from one to another only by making its way through their thin walls. And so short are the wood-cells generally, that, to rise a foot in such a tree as the basswood, the sap has to pass through the walls of about two thousand of these cells. There are no continuous¹¹ *veins*, as many suppose, through which the sap of trees rises. Wood-cells in the bark are generally longer than in the central parts; they give great toughness to the inner bark of many plants, and they furnish the invaluable fibres of flax and hemp.

12. In addition to the cells which have been described, there are larger cells called *ducts*, which are either long single cells overlapping one another, or rows of cells placed end to end. Some of these are so large that they may be seen by the naked eye when cut across, but they are usually much too small for this. There are also, in various plants, canals or cavities formed between or among the cells, and filled with the particular products of the plant, such as milk, oil, turpentine, etc.

13. These various cells constitute the substance or framework of plants, from the mushroom of a night to the oak of centuries. The diversities of appearance which they present, when viewed by the aid of a microscope, enable us to distinguish one kind of vegetable growth from another, as the fibres of flax or *linen* from *cotton*, even when twisted and woven together, and thus to detect frauds in the manufacture

Fig. 4.



At 12 are represented portions of vascular tissue, showing the spiral arrangement of the fibres. At 13, a common arrangement of the wood-cells through which the sap circulates, placed end to end, or partially overlapping each other. At 14 is shown the appearance of fibres of flax, when viewed by the microscope; and at 15, the twisted appearance of fibre of cotton.



of cloths, where the cheaper material of cotton is intermixed with linen. (Fig. 4.) Our obligations to the woody fibre of plants are infinite, for without it we should have neither linen nor cotton cloths, neither sails nor cordage for our ships, nor a door-mat upon which to clean our shoes; without it the books of the present day would have no existence, for the paper upon which they are printed is made of wooden fibre.

14. All plants have a covering called the *cuticle*; and this, formed of cells also, extends from the lowest root to the topmost twig, spreading over every leaf, and enveloping the whole plant. Yet in one of the great classes of plants, the *exogenous*, or outward-growing, this covering differs essentially from that of the *endogenous*, or inward-growing; for, while in the former it constitutes the true bark, which is separable from the wood, in the latter it is only a hardening of the outward portion of the stem. We shall hereafter see that this covering has offices to perform, especially in the leaves, quite similar to the functions of the human skin, which we have already described.

¹ AD-PĒR'-ENT, united.

² GĒRM, beginning; origin; first principle.

³ OM-NIS'-CIENCE, universal knowledge.

⁴ "IN MIN'-IA-TŪRE," on a very small scale.

⁵ MŪR'-I-ADS, immense multitudes.

⁶ RĪND, skin; bark, or outer coat.

⁷ MĀZE, intricate winding.

⁸ "LUCID WEBS," the webs of life, well known to Him who wove them.

⁹ PRŌC'-ESS, pronounced prŏs'-ess.

¹⁰ TĪS'-SŪE (*tsh-shū*), that which has the appearance of being woven.

¹¹ CON-TĪN'-Ū-OUS, separate; uninterrupted.

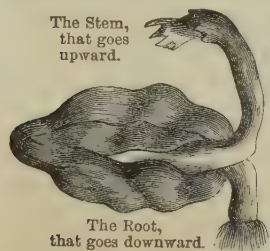
LESSON IV.

THE ROOTS OF PLANTS.

1. IN what manner does the plant grow? and by what means is it nourished? are questions to be answered at the very outset¹ of our inquiries² into the physiology of vegetation. We are therefore next brought to consider those compound³ organs of plants which perform, among other functions,⁴ that of nutrition.

2. It is necessary to vegetable growth that certain substances should be absorbed, in a liquid state, through the *roots*, and that this nutritive liquid, or sap, should circulate through the *stem* to the *leaves*, which latter are the respiratory

or breathing organs, performing functions similar to the lungs of animals. From the leaves the sap is returned to the stem, after having been acted upon by the atmosphere, in a condition suitable for the formation of the new growth of the plant.



3. When the proper conditions of heat, light, and moisture allow the germination⁵ of the seed, which may be considered as a plant whose vital powers are dormant,⁶ its outer shell or covering bursts, and, in whatever position the seed is planted, the stem goes upward, while the rootlet invariably turns downward,

and spreads out its little fibres to suck up nourishment from the earth.

4. In some rare instances roots may become branches, and branches act as roots. A maple-tree may be inverted,⁷ the branches being buried in the ground and the roots extended in the air, without killing the tree. The stems of some plants send out fibres which take root in the earth; and frequently twigs stuck in moist earth will take root and become large trees. Nearly two thousand years ago the Mantuan⁸ bard thus discoursed on this mode of propagation:

5. "These ways of planting Nature did ordain
For trees, and shrubs, and all the sylvan train.
Others there are, by late experience found :
Some cut the shoots, and plant in furrowed ground :
Some cover rooted stalks in deeper mould ;
Some cloven stakes, and (wondrous to behold !)
Their sharpened ends in earth securely place,
And the dry poles produce a living race.

6. "Some bow the vines ; and, buried in the plain,
Their tops in distant arches rise again.
Others no root require : the lab'rer cuts
Young slips, and in the soil securely puts :
Even stumps of olives, bared of leaves, and dead,
Revive, and oft redeem their withered head."

It is probable that some allowance is to be made for the poet's privilege in Virgil's account of the *dry poles*; but it is not uncommon to see posts, set out for fences, growing as trees.

7. Although no solid substance can find its way through the roots into the plant, yet as the water which the rootlets absorb from the earth always contains earthy matters, it is through this medium that the plant is nourished, when the matter in solution⁹ is such as the plant requires for its structure.¹⁰ In this way, also, the plant is poisoned when substances injurious to it are thrown around the roots; and in the same way the wood of trees designed for ornamental purposes has been dyed by chemical substances.*

8. Although roots generally grow in the ground, yet some, like those of parasites¹¹ and air-plants, grow upon other vegetables, and have no immediate connection with the soil. Nor does it follow that all subterranean¹² vegetable organs are roots. The root-stalks of the sweet flag and ginger, also tubers like the common potato, artichoke, and dahlia, and the bulbs of the turnip, lily, tulip, and onion, may very properly be considered as underground stems, although, in botanical language, they are usually described as roots. (Fig. 6.)

Fig. 6 The Roots of Plants.



Fig. 6.—Botanists not only give particular names to all parts of plants, but also particular terms to express their principal varieties of form. Hence, in advanced works on Botany, these terms must be defined and explained. Although, of the root, stem, and leaves, the former is the simplest, and least varied in its modifications, yet it exhibits quite a number of varieties in form, the principal of which will be described here.

At 1 is shown the sprouting of a grain or kernel of corn, sending upward a little stalk which contains a *single* seed-leaf, or *co-tyl-ē'-don*, but has wrapped up in it other leaves. At 2 the corn plant is seen farther advanced, each leaf coming out from within the others as the plant grows. A cluster of *fibrous* or thread-like roots has also made its appearance.

At 3 is the seedling plant of the maple, with its pair of seed-leaves, or *co-tyl-ē'-dons*, showing that it belongs to the class of *di-co-tyl-ē'-don-ous* plants (see note, page 193). At 4 is a turnip-shaped or *nā'-pi-form* root; 5, spindle-shaped, like a radish; 6, roots of the dahlia, *clustered* and *tuberous*; 7, the potato, also *tuberous*; 8, the crocus, which is merely a short and thick rootstock; 9, the bulb, or solid bulb of the lily; 10, the scaly bulb of the Solomon's seal, properly an underground stem; 11, the rootstock of the Solomon's seal, properly an underground stem; 12, the strawberry, sending out *runners*, which take root and produce new plants.

9. Roots are classified, in respect to duration, as *annual*,¹³ *biennial*, and *perennial*. Annual roots are fibrous,¹⁴ and produce, during their brief existence of a single season, herbage, flowers, and seeds. Biennial plants produce leaves the first year, but their flowers, fruit, and seeds appear during the second and last year of their existence. Perennial plants live through a series of years, producing leaves, flowers, and seeds during the natural period of their lives, which is sometimes reckoned by centuries.¹⁵

¹ OUT'-SET, beginning.

² IN-QUI'-RIES, questions; seeking for information.

³ COM'-POUND, not simple; composed of several parts, or of different materials.

⁴ FŪŃC'-TIONS, offices; employments.

⁵ GERM-I-NĀ'-TION, the act of sprouting.

⁶ DÖR'-MANT, in a sleeping state.

⁷ IN-VĒRT'-ED, turned upside down.

⁸ "MĀN'-TU-ĀN BĀRD," Virgil: called the Mantuan bard because he was born near Mantua, in Italy.

⁹ "MATTER IN SOLUTION," that which is dissolved in the water.

¹⁰ STRŪCT'-ŪRE, growth or formation.

¹¹ PAR'-A-SITES, plants that live and grow on other plants.

¹² SUB-TER-RĀ'-NE-AN, being under the surface.

¹³ ĀN'-NĒ'-AL. BĪ-ĒN'-NI-AL. PER-EN'-NI-AL.

¹⁴ PĪ'-BROUS, having small thread-like roots.

¹⁵ CĒN'-TŪ-RIES, hundreds of years.

LESSON V.

CHANGES PRODUCED BY CULTIVATION.

1. THE changes which *roots* and *tubers* can be made to undergo¹ are numerous and highly beneficial to man. The potato, for example, is a native of tropical America, and when found wild its tubers are small and scarcely fit to be eaten, while it has been rendered by cultivation one of the most valuable articles of food. The produce² of an acre of wild potatoes could be held in a single measure, while the same area,³ under cultivation, will sometimes yield two or three hundred bushels. Cultivation has produced a thousand varieties of this tuber, varying in shape, size, color, and quality.

2. Beets, parsnips, and turnips are also made to assume many variations under proper cultivation. The bulb of the latter, for instance, has, since the beginning of the present century, been changed from globular⁴ to spindle-shaped, in colors from white and yellow to purple and green, and in weight from a couple of ounces to twenty pounds. So also with the carrot, which in a wild state is a slender, tapering root of a yellowish-white color, but which, by cultivation, increases in

size, and assumes a deep red or orange color. In the one case the root is not much thicker than a common quill, in the other it becomes as thick and long as a man's arm.

CHAMBERS.

¹ UN-DEE-GŌ', pass through.

² PRŌD'-UOE, that which is produced.

³ Ā'-RE-A, extent of surface.

⁴ GLŌB'-Ū-LAR, roundish; like a globe.

LESSON VI.

THE STEMS OF PLANTS.

Fig. 7.



Cross section of an Ex-og'-en-ous stem.

medium for the circulation of the sap.

2. It has been stated that the two great divisions of flowering plants are the outward-growing, or exogenous, and the inward-growing, or endogenous. The stems of these two divisions differ widely in arrangement and appearance, as may be seen by examining the two representations of them on the next page. (See Fig. 8-9.) The exogenous plants have an outer bark, a wood, and pith; the wood is arranged in circular layers around the centre by yearly additions; and there are rays branching from the central part to the circumference. These rays add great beauty to many kinds of wood, where they are known by the name of *silver grain*. In maple and oak they are very conspicuous.¹

Fig. 7, above, represents a cross section of an ex-og'-en-ous stem, one of the cone-bearing species in the eighth year of its growth, showing eight distinct zones, or layers, surrounding the central pith. In this specimen the markings are very distinct.

3. In the endogenous, or inward-growing stems, there are no concentric² circles of wood; neither is there pith or bark; but bundles of woody fibres are scattered throughout the cell work. While an exogenous stem, when cut across, shows the circular layers, which represent the number of years of its growth, as in the example which we have given in Fig. 7, the endogenous stem is merely an irregular mass of cells and woody fibre.

4. The division of plants into herbs, shrubs, and trees, is based on peculiarities³ of the stem. The root of an herb may be perennial,⁴ but its stem is annual,⁵ and dies at the end of the first year, as we see in the hollyhock. A tree has perennial roots and stem, which are of woody fibre, with a distinct trunk or body between the roots and branches. A shrub is a small tree which sends out branches from the surface of the ground, and has no distinct trunk.

5. In the lower orders of vegetable life there is a kind of plants, most of them very small, which have neither branches nor leaves. As they are "flowerless plants," they form a

Fig. 8.
EX-OÛ'-EN-OUS.

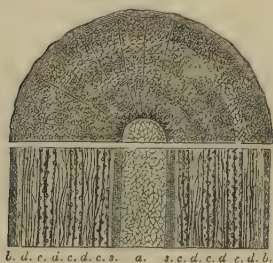


Fig. 9.
EN-DOÛ'-EN-OUS.



Fig. 8 represents the *ex-ou'-en-ous* stem of the oak in the fourth year of its growth. The lower part is a vertical section, and the upper part a cross section, or horizontal section. In the horizontal section four distinct layers are seen surrounding the pith in concentric circles. The lines branching outward from the pith to the bark are the *med'-ul-lary rays*.

At *a* is shown the pith; *b*, the bark; *c, c, c*, dotted ducts; *d, d, d*, layers of woody fibre; *s*, spiral vessels of the *med'-ul-lary sheath*.

Fig. 9 represents the *en-doû'-en-ous* stem of the palm, the upper part being a horizontal section, and the lower vertical. As the new growth takes place constantly from *within*, the vascular fibres *f, f, f, f*, are constantly pushed *outward* and compressed, and the outer part of the stem—the rind or covering—becomes the hardest, which is the reverse of what takes place in the *ex-ou'-en-ous*, or outward-growing plants. In the *en-doû'-en-ous* stem there is no distinction of pith, wood, and bark, nor does a cross section show any concentric arrangement of annual layers.

class by themselves.* The red snow of polar regions, the green scum of stagnant water, the fungus⁶ growth on decayed wood, and various kinds of mould and mildew so common in damp places, are mostly flowerless plants. Yeast, to which we have already alluded, consists of a little cell plant of the same family. Rust and smut in grain, and dry rot in wood, are composed of similar minute plants.

6. The lowest grade of plants with stems are liverworts, which grow in wet places. Next come the mosses with stems and distinct foliage, and ferns which frequently grow several feet in height, with a peculiar stem called a *stipe*. Probably the highest grade of flowerless plants in this country is the scouring rush, which seems to be all stem, and entirely destitute of leaves. It grows in sandy places, and contains so much silex, or sand, that it is used for scouring and polishing articles of furniture. In ascending the scale of vegetable development⁷ we come next to grasses, sedges, rushes, lilies, flags, reeds, and palms.

7. All endogenous stems rapidly attain their full size, which seldom exceeds eighteen inches in diameter, though the height sometimes reaches one hundred and fifty feet. It is in the exogenous division of plants that the famed trees of mammoth growth are found. Pliny, an ancient writer, mentions one, in the hollow trunk of which Lucan, the Roman consul, supped and slept with twenty men. A chestnut-tree on Mount Etna is said to be sixty-four feet in diameter, and it is of such renown⁸ that it is mentioned in ancient maps of Sicily.

8. Travelers in Africa have described the gigantic baobab-trees, one of which, at the mouth of the Senegal River, is supposed to be upward of two thousand years old. On the opposite page is a drawing of it. It has a short and massive trunk, thirty feet in diameter. When seen at a distance it presents almost the appearance of a forest, and it is not till the spectator has satisfied himself by a near inspection⁹ that he can be convinced that the luxuriant verdure above pro-

* They are called "flowerless," or *cryptogamous* plants. The latter name, which means "hidden fructification," intimates that they may have something answering to flowers and seeds, although not the same as seeds; and this is now known to be the case with most of them.

ceeds from a solitary stem. This enormous tree, clothed with its brilliant verdure and snowy blossoms, must be a magnificent spectacle; and we can not wonder at the feelings which prompt the un-

Fig. 9.



The Baobab-tree.

tutored¹⁰ negro to worship under its shade, and hail the opening of its flowers with pious veneration.¹¹

9. But even the great baobab must yield in dimensions to the mammoth red-wood trees of California. One of these trees was three hundred feet in height, and thirty in diameter, and its bark was fifteen inches in thickness. When it was felled,¹² the trunk was perfectly sound to the centre. The largest of the group, known as the "Father of the Forest," has long been prostrated; but it is great even in its ruins. It is estimated that it was four hundred and twenty feet in height, or only a few feet lower than the highest of the Egyptian pyramids.

10. The stems of some trees send down branches which take root in the earth and form new trunks. The most remarkable instance of a plurality of trunks is seen in the banyan-tree of India. It has at first but one stem; but from the branches leafless shoots are sent down, which, taking root, become secondary stems. This process is repeated till one tree makes a forest. There is said to be one in Hindostan with three hundred and fifty larger trunks and three thousand smaller ones, covering seven acres, and furnishing shelter for seven thousand men.

11. These magnificent natural temples are esteemed¹³ sacred by the Hindoos, and are dedicated¹⁴ to religious rites.¹⁶ Milton has beautifully described this tree:

"Branching so broad and long, that in the ground
The bended twigs take root; and daughters grow

About the mother tree, a pillar'd shade,
High over-arched, and echoing walks between."

12. Another kind of stem, remarkable in many respects, is that of the cactus, an order of plants found almost exclusively in America, and abundant in Mexico, Oregon, and California. They are usually leafless plants, presenting their juicy stems under a great variety of forms, from that of an egg to a lofty fluted column, and, in the case of the giant cactus of California, exhibiting a leafless branching trunk fifty or sixty feet in height. Growing mostly in hot, dry, and rocky places, where they are exposed for many months in the year to the fiercest beams of a tropical sun, they are remarkably adapted, by a wise provision of Nature, to the situations in which they are destined to live.

Fig. 10.



13. During the wet season of the year they grow rapidly, and so fill themselves with nourishment that they may be literally said to gorge¹⁶ themselves with food. Then, when the rains cease, and the air becomes dry, and the spirit of the desert resumes his withering dominion over their climate,

Fig. 10, Cactus Plants. At 1 is seen the *Cactus opuntia*, or prickly-pear cactus, its stem and branches forming a succession of thick and flattened joints; at 5 is one similar, but with shorter and flatter joints; 2 and 4 are plants belonging to the *Cereus* genus of cactuses, the latter being the giant cactus of California, which rises to the height of 50 or 60 feet; 3 is the melon cactus; and 6 is the *Cereus speciosissimus* in full bloom.

and all the gay companions of the cactus droop and die, these juicy plants, closing their pores to prevent evaporation,¹⁷ feed on their garnered¹⁸ stores, and preserve the most robust health, not for days merely, but for months. In their power of enduring long-continued drouth,¹⁹ they may be considered to fill that place in the vegetable world which is occupied in the animal kingdom by the camel of the desert.

¹ CON-SPĪC'-I-ŌUS, plain ; easily seen.

² CON-CĒN'-TRE, having a common centre.

³ PE-CŪL-IĀR'-I-TIES, particular features.

⁴ PER-ĒN'-NI-AL, lasting many years.

⁵ AN'-NŪ-AL, lasting but one year.

⁶ FŪN'-GUS (*fūng'-gus*), like a mushroom.

⁷ DE-VĒL'-OP-MĒNT, progress to higher forms ; an unfolding.

⁸ RE-NOWN', repute ; notoriety ; so well known.

⁹ IN-SPĒC'-TION, view ; examination.

¹⁰ UN-TŪ'-TORED, not instructed ; untaught.

¹¹ VĒN-ER-Ā'-TION, reverence.

¹² FELLED, cut down.

¹³ ES-TEEM'ED, regarded ; held.

¹⁴ DĒD'-I-CA-TED, solemnly set apart.

¹⁵ RĪTES, religious ceremonies.

¹⁶ GŌRGE, to fill to overflowing ; to glut.

¹⁷ E-VAP-O-RĀ'-TION, passing off in vapor a drying up.

¹⁸ GĀR'-NERED, gathered ; laid up in store.

¹⁹ DROUTH, dryness ; want of rain.

LESSON VII.



THE BANYAN-TREE.

1. 'Twas a fair scene wherein they stood,
A green and sunny glade¹ amid the wood,
And in the midst an aged banyan grew.
It was a goodly sight to see
That venerable tree ;
For o'er the lawn,² irregularly spread,
Fifty straight columns³ propped its lofty head.

And many a long depending⁴ shoot
 Seeking to strike its root,
 Straight, like a plummet, grew toward the ground.

2. Some on the lower boughs, which crossed their way,
 Fixing their bearded fibres,⁵ round and round,
 With many a ring and wild contortion⁶ wound;
 Some to the passing winds, at times, with sway
 Of gentle motion swung;
 Others of younger growth, unmoved, were hung,
 Like stone-drops from the cavern's fretted⁷ height.⁸
 Beneath was smooth and fair to sight,
 Nor weeds nor briers deform'd the natural floor;
 And through the leafy cope⁹ which bowered it o'er
 Came gleams of checker'd light.
 So like a temple did it seem, that there
 A pious heart's first impulse would be prayer.

SOUTHEY.

¹ GLÄDE, an opening in a wood.

² LAWN, a space of ground covered with grass.

³ CÖL'-UMNS (*köl'-ums*), stems.

⁴ DE-PĒND'-ING, hanging from.

⁵ FĪ'-BRES, thread-like roots or tendrils

⁶ CON-TÖR'-TION, a twisting.

⁷ FĒET'-TED, interwoven like net-work

⁸ HEĪGHT, top; ceiling overhead.

⁹ CÖPE, covering; arch-work.

LESSON VIII.

THE LEAVES OF PLANTS.

1. It has been seen, in the article on Human Physiology, that in the cuticle or skin of man there are little openings or pores, which may be regarded as the breathing-holes of the skin, but that the lungs are, nevertheless, the principal organ by which the blood is purified. Leaves may be considered the lungs of plants; for in the cuticle or covering of all green leaves there are minute apertures,¹ like the openings of the perspiration tubes in the human skin; and it is through these that the sap is brought in contact with the air for purposes of respiration² and exhalation.³

2. So minute⁴ are these openings, visible only by the aid of the microscope, that more than one hundred thousand of them occur⁵ in a square inch of the surface of some leaves. They are usually most numerous on the under side of a leaf,

except where both sides are equally exposed to the influence of air and light. The number of these breathing mouths in a single tree of some kinds is almost beyond calculation; for it has been estimated that the leaves of a single large elm-tree have a leaf surface of not less than five acres! (Fig. 11.)

3. We have seen that the first and most important division of leaves is into net-veined and parallel-veined, the former belonging to exogenous plants, and springing from two-lobed seeds, as the acorn and the bean; and the latter belonging to endogenous plants, and springing from single seeds, as the palms and the grasses.* Leaves are also classified as simple and compound. Their principal varieties may be learned from the accompanying illustrations.

4. The surface of the leaf also affords a means of classification⁶ into smooth, downy, hairy, and rough leaves. According to their duration, leaves are called *fugacious*⁷ when they fall off during the summer, *deciduous*⁸ when they fall in autumn, and *persistent*⁹ when they remain during the winter, and gradually give place to new leaves in the spring.

5. In cold regions leaves are small and highly polished, as if to reflect what little heat and light may fall upon them. Plants growing on mountains and dry places have gutters to

* The seeds which have *two* lobes are called by botanists *di-co-tyl-é'-don-ous*, because, when they germinate, they produce two *co-tyl-é'-dons*, or seed-leaves. The single seeds are called *mon-o-co-tyl-é'-don-ous*, because they produce but a single *co-tyl-é'-don*, or seed-leaf.

Fig. 11.



Fig. 11 is a horizontal section of a leaf highly magnified. At *v, v, v* are shown the small veins in the leaf, and *s, s, s* indicate the little pores or breathing-holes, which, in botanical language, are called *stomata* or *stomates*. Destroy the leaves of a tree in mid-summer, and, as the tree will then be unable to breathe, it will wither, and in most cases will soon die.

convey the moisture that may fall upon them to their roots. In tropical countries leaves grow large and broad, as the talipot palm of Ceylon, whose single leaf often affords covering for a whole family.

Fig. 12.



6. Sometimes leaves present very singular forms, as those of several species of pitcher-plants, some of which have connected with them complete vases, with a nicely fitting lid or cover. Many of these plants are found in Southern Asia. The cup of the Chinese pitcher-plant holds about a tumblerful of sap, which is poured out from its inner side. This plant is quite common in Ceylon, where it is called monkey-cup, because the monkeys sometimes open the lid and drink the water. (Fig. 12.)

7. In India there is also a climbing stem of a species of the pitcher-plant, one hundred feet long, and destitute of leaves till near the extremity, so that it seems impossible that it should receive its nourishment from the ground by absorption.¹⁰ This

Fig. 12.—At 1 is a species of *Dischidia*, in which the pitcher is at the end of the stem, which grows through the leaf. At 2 is the *Nepenthes distillatoria*, the true pitcher-plant of India. The pitcher is at the end of an extension of the midrib of the leaf. At 3 is the *Sarracenia purpurea*, the American side-saddle flower, in which a leaf, collapsing and uniting at its edges, forms the pitcher. At 4 is also a species of the *Nepenthes*, often called the Chinese pitcher-plant. The lid is generally shut down.



I. SIMPLE LEAVES.—At 1 is what is called a *linear* leaf. It is also *parallel-veined*, like Nos. 21, 23, and 24, showing that it belongs to the plants which have but *one* co-tyl-*o*-don, or seed-leaf. At 2 is a *lan'-ce-o-late* leaf; 3, *el-lip'-tic-al* leaf; 4, *o'-vate*; 5, *ob-lan'-ce-o-late*; 6, *ob-o'-vate*; 7, *cū'-ne-ate*, or wedge-shaped; 8, *sag'-it-tate*; 9, *au-ric'-u-late*, or eared, and *sag'-it-tate* when the ears are pointed and turned downward; 10, *has'-tate*, or spear-shaped.



At 11 is a leaf that is both *o'-vate* and *a-cūte'*; 12 is *cord'-ate*, or heart-shaped; 13, *ren'-i-form*, or kidney-shaped; 14, *pelt'-ate*, or shield-shaped, and also *or-bic'-ū-lar*; 15, *lobed*, or *pinnately-lobed*; 16, *pinnately-cleft*; 17, *pinnately-parted*; 18, *pinnately-divided*.

plant has a pitcher or cup, but without any lid, formed of a leaf with its edges rolled toward each other till they meet and adhere,¹¹ while the upper part, from which it is suspended, is open to receive the rain or dew.

Fig. 13.



hanging from the branch, and dipping into the pitcher, apparently for a new supply of aliment.¹³ (Fig. 13.)

Fig. 14.



8. This pitcher always contains a fluid, composed of the sap of the plant and water, in which a number of black ants and flies are generally seen. It is supposed that by their decomposition¹² the plant is nourished. A still more wonderful appearance is presented by a tuft of fibres, hanging from the branch, and dipping into the pitcher, apparently for a new supply of aliment.¹³ (Fig. 13.)

9. A very singular plant grows in North and South Carolina, on the Cape Fear and Santee rivers, which is especially adapted to catching flies, and hence is called a fly-trap. The trap is open when the sun shines, ready, as soon as a fly touches any of the long hairs within its leaves, to close suddenly, and hold it fast until its struggles are over, when it slowly opens for another victim. The locality of this vegetable wonder, a drawing of which is here given, is confined to the region of the rivers named above, nor is it found in any other part of the world. (Fig. 14.)

Fig. 13 is the *Dischidia rafflesiana* of Asia, in which the pitcher is a leaf united at its edges. This pitcher has no lid.

Fig. 14 is the Venus fly-trap, *Dionaea muscipula*, of Carolina. At *a* and *b* are flies, caught by the sudden closing of this singular leaf-trap.



II. COMPOUND LEAVES.—At 19 are *pinnate* leaves, or those in which the leaflets are arranged on the sides of a main leaf-stalk. Pal'-mate or dig'-it-ate leaves are those in

10. At night many leaves assume a drooping position, owing to the withdrawal of the stimulus¹⁴ of light. This folding of the leaves is commonly called the *sleep of plants*. It is especially noticed in those of clover, and in peas and other pod-bearing plants. Even the foliage of trees with compound leaves or leaflets, as the locust, manifests¹⁵ this folding of the leaves in sleep. If kept in the dark all day, the sleeping leaves are not aroused, but they are sensitive to artificial light at night. Plants of different species assume different positions at night, but the position is constant for those of the same species.

11. All deciduous⁸ leaves change their color in autumn. The green color becomes of a golden or crimson tint, changing to a russet,¹⁶ and often presenting the most beautiful and gorgeous appearance. American forests, especially those in which the maple is abundant, are said to excel, in this respect, those of the Old World. An English lady-tourist is said to have been so delighted with the dazzling splendor of American forest leaves in autumn that she procured a supply to ornament a ball-dress, to

“Deck the gay halls
Of her far distant home.”

12. As swans are said to sing most sweetly just before they die; as some species of fish exhibit the richest colors as they expire; as soap-bubbles assume the brightest rainbow-

which the leaflets are borne on the very tip of the leaf-stalk, as at 20. At 21 is a *perforate* leaf; and at 22 one that is *connate-perforate*. *Equitant* leaves, as at 23, are those which partly inclose or *straddle over* each other. At 24 the leaves are whorled, or arranged around the stem on the same level; and at 25 they are *opposite* each other.

Particular terms are also used to designate the forms of the *apex*, or end of the leaf, as at *a* it is *acuminate*; *b*, *acute*; *c*, *obtuse*; *d*, *truncate*; *e*, *emarginate*, or notched; when deeply notched, it is *obcordate*; *g*, sharp-pointed, is *cuspidate*; *h*, short-pointed, is *muticulate*.



At 26 is a *three-lobed* leaf; 27, *three-cleft*; 28, *three-parted*; 29, *three-divided*, or *partly-divided*.

The various forms of the *margins* of leaves are also indicated by particular terms. When their general outline is completely filled out, they are said to be *entire*; 30 is *serrate*, or saw-toothed; 31, simply *dentate*, or toothed; 32, *crenate*, or scalloped; 33, *repand*, or wavy; 34, *sinate*, having deeper curves than the repand; 35, *incised*, which means cut, or *jagged*.

tints the instant before they vanish in thin air, so leaves take on their most beautiful dyes¹⁷ in the cool autumn days, "the saddest of the year."

"Has it come' the time to fade' ?
And with a murmured sigh,
The maple, in his scarlet robe,
Was first to make reply."

13. This change is not necessarily effected by cold, for it often appears before the earliest frost, and is premonitory¹⁸ of the fall of the leaf. One by one they fall, till, as Coleridge has so prettily sung, there is seen but

"The one red leaf, the last of its clan,
That dances as often as dance it can ;
Hanging so light, and hanging so high,
On the topmost bough that looks up at the sky."

14. But, according to Byron, in his description of an English autumn,

"What is lost in green is gained in yellow ;"

and Southey could see a pleasant sign of coming Christmas in

"These fading leaves,
That with their rich variety of hues
Make yonder forest in the slanting sun
So beautiful."

15. "September strews the woodland o'er
With many a brilliant color ;
The world is brighter than before—
Why should our hearts be duller' ?
Sorrow and the scarlet leaf' !
Sad thoughts and sunny weather' !
Ah me' ! this glory and this grief
Agree not well together."

¹ ÄP'-ER-TÜRES, openings ; holes.

² RES-PI-RÄ'-TION, the act of breathing ; taking in air.

³ EX-HA-LÄ'-TION, the act of sending forth fluids in the form of vapor.

⁴ MI-NÜTE', very small.

⁵ OC-CUR', exist ; are found.

⁶ CLAS-SI-FI-CÄ'-TION, arranging in classes.

⁷ FU-GÄ'-CI-ÖUS, flying away.

⁸ DE-CÏD'-Ü-ÖUS, falling in autumn.

⁹ PER-SIST'-ENT, continuing without withering.

¹⁰ AB-SORP'-TION, the act of *drinking in*, or sucking up nourishment.

¹¹ AD-HËRE', stick together.

¹² DE-COM-PO-SI'-TION, decay.

¹³ AL'-I-MENT, food ; nutriment.

¹⁴ STIM'-Ü-LUS, something that rouses to action.

¹⁵ MAN'-I-FESTS, shows plainly.

¹⁶ RUS'-SET, reddish-brown.

¹⁷ DYES, colors ; hues.

¹⁸ PRE-MON'-I-TO-RY, giving previous warning or notice.

LESSON IX.

THE ANGEL OF THE LEAVES: AN ALLEGORY.

[An allegory is a species of fable, in which one thing is described by something else that resembles it. We have a fine example of an allegory in the eightieth Psalm, in which God's chosen people are represented by a vineyard. In the following allegory the desponding, sorrowing, and afflicted soul, mourning its desolation, but afterward cheered by the gracious promises of our heavenly Father, is described by the fable of the tree in autumn, stripped of its leaves, chilled by the cold, and pelted by the storm, but cheered by the angel of the leaves with the promise of a new robe when spring shall return again.]



The Tree stripped of its leaves in Autumn.

1. "ALAS! alas!" said the sorrowful tree, "my beautiful robe is gone! It has been torn from me. Its faded pieces whirl upon the wind; they rustle beneath the squirrel's foot as he searches for his nut. They float upon the passing stream and the quivering lake. Woe is me! for my fair, green vesture¹ is gone. It was the gift of the angel of the leaves! I have lost it, and my glory has vanished; my beauty has disappeared. My summer hours have passed away. My bright and comely² garment, alas! it is rent in a thousand parts.

2. "Who will weave me such another? Piece by piece it has been stripped from me. Scarcely did I sigh for the loss of one ere another wandered off on the air. The sound of music cheers me no more. The birds that sang in my

bosom were dismayed at my desolation. They have flown away with their songs.

3. "I stood in my pride. The sun brightened my robe with his smile. The zephyrs³ breathed softly through its glossy folds; the clouds strewed pearls among them. My shadow was wide upon the earth. My arms spread far on the gentle air; my head was lifted high; my forehead was fair to the heavens. But now how changed! Sadness is upon me; my head is shorn, my arms are stripped; I can not now throw a shadow on the ground. Beauty has departed; gladness is gone out of my bosom; the blood has retired from my heart—it has sunk into the earth.

4. "I am thirsty, I am cold. My naked limbs shiver in the chilly air. The keen blast comes pitiless among them. The winter is coming; I am destitute. Sorrow is my portion. Mourning must wear me away. How shall I account to the angel who clothed me for the loss of his beautiful gift?"

5. The angel had been listening. In soothing accents he answered the lamentation. "My beloved tree," said he, "be comforted. I am with thee still, though every leaf has forsaken thee. The voice of gladness is hushed among thy boughs, but let my whisper console thee. Thy sorrow is but for a season. Trust in me; keep my promise in thy heart. Be patient and full of hope. Let the words I leave with thee abide⁴ and cheer thee through the coming winter. Then I will return and clothe thee anew.

6. "The storm will drive over thee; the snow will sift through thy naked limbs. But these will be light and passing afflictions. The ice will weigh heavily on thy helpless arms, but it shall soon dissolve into tears. It shall pass into the ground, and be drunken by thy roots. Then it will creep up in secret beneath thy bark. It will spread into the branches it has oppressed, and help me to adorn them; for I shall be here to use it.

7. "Thy blood has now only retired for safety. The frost would chill and destroy it. It has gone into thy mother's bosom for her to keep it warm. Earth will not rob her offspring. She is a careful parent. She knows the wants of all her children, and forgets not to provide for the least of them.

8. "The sap, that has for a while gone down, will make thy roots strike deeper and spread wider. It will then return to nourish thy heart. It will be renewed and strengthened. Then, if thou shalt have remembered and trusted in my promise, I will fulfill it. Buds shall shoot forth on every side of thy boughs. I will unfold for thee another robe. I will paint it and fit it in every part. It shall be a comely raiment. Thou shalt forget thy present sorrow. Sadness shall be swallowed up in joy. Now, my beloved tree, fare thee well for a season."

9. The angel was gone. The muttering winter drew near. The wild blast whistled for the storm. The storm came and howled around the tree. But the word of the angel was hidden in her heart; it soothed her amid the threatenings of the tempest. The ice-cakes rattled upon her limbs; they loaded and weighed them down.

10. "My slender branches," said she, "let not this burden overcome you. Break not beneath this heavy affliction; break not, but bend, till you can spring back to your places. Let not a twig of you be lost. Hope must prop you for a while, and the angel will reward your patience. You will move upon a softer air. Grace shall again be in your motion, and beauty hanging around you."

11. The scowling face of winter began to lose its features. The raging storm grew faint, and breathed its last. The restless clouds fretted themselves to atoms; they scattered upon the sky and were brushed away. The sun threw down a bundle of golden arrows. They fell upon the tree; the ice-cakes glittered as they came. Every one was shattered by a shaft. They were melted and gone.

12. The reign of spring had come. Her blessed ministers were abroad in the earth; they hovered in the air; they blended their beautiful tints, and cast a new-created glory on the face of the heavens.

13. The tree was rewarded for her trust. The angel was true to the object of his love. He returned; he bestowed on her another robe. It was bright, glossy, and unsullied.⁵ The dust of summer had never lit upon it; the scorching heat had not faded it; the moth had not profaned⁶ it.



The Tree in Summer.

14. The tree stood again in loveliness ; she was dressed in more than her former beauty ; she was very fair ; joy smiled around her on every side. The birds flew back to her bosom. They sang on every branch a hymn to the angel of the leaves.

MISS H. F. GOULD.

15. Now each tree, by summer crown'd,¹
Sheds its own rich twilight round.
Glancing there, from sun to shade,
Bright wings play ;
There the dew its couch hath made—
Come away !
Where the boughs, with dewy gloom,
Darken each thick bed of bloom—
Come away !
Where the lily's tender gleam
Quivers on the glancing stream—
Where the fairy cup-moss lies,
With the wild-wood strawberries,
Come away—away !

HEMANS.

¹ VEST'-URE, garment ; robe.

² COME'-LY (*kum'-ly*), suitable ; beautiful.

³ ZEPH'-YR (*zef'-er*), the west wind ; any soft, mild breeze.

⁴ A-BIDE', remain with thee.

⁵ UN-SUL'-LIED, not sullied ; not sainted.

⁶ PRO-FAN'-ED, polluted ; defiled.

⁷ CROWN'D, adorned with leaves.

LESSON X.



POETICAL IMAGERY DERIVED FROM THE VEGETABLE WORLD.

1. "THEN deep in the greenwood rode he,
And asked of every tree ;
Oh, if ye have ever a singing leaf,
I pray you to give it me.
2. "But the trees all kept their counsel ;¹
They said neither yea nor nay ;
Only there sighed from the pine-tops
A music of seas far away.
3. "Only the aspen² pattered
With a sound like growing rain,
That fell ever fast and faster,
Then faltered to silence again."
J. RUSSELL LOWELL. *Ballad of the Singing Leaves.*

4. There are no objects in nature more familiar to us than the leaves of trees ; there are none upon which most persons look with greater interest and delight, and none around which cluster a greater variety of pleasing associations.³ In the different stages of their growth and decay they are often

referred to as emblems⁴ of the life of man ; their freshness in spring aptly denoting the season of youth and hope, and their autumnal hues admonishing of the approaching winter of old age, when, life's pleasures and enjoyments being over, man is often forced to say,

“I have lived long enough ; my way of life
Is fall'n into the *sere*⁵ and *yellow leaf*.”

5. The writings of all ages abound in poetical imagery⁶ drawn from the vegetable world ; and where vegetation is the most abundant, it has exerted the greatest influence upon the literature⁷ of the people.

“In Eastern lands they *talk* in flowers,
And they tell in a garden their loves and cares ;
Each blossom that blooms in their garden bowers,
On its leaves a mystic⁸ language bears.”—PERCIVAL.

6. The “flowers of spring,” the “green fields,” the “ripened fruit,” the “decaying herbage,” whether they teem with cheering or with saddening associations, are things that memory ever loves to dwell upon. How natural was it that the poet, in describing Falstaff's dying moments, should paint even the hoary profligate,⁹ in his spirit wanderings, as “babbling of green fields.” And how touchingly does Cardinal Wolsey, from the similitude¹⁰ of a plant, portray the vicissitudes¹¹ of human life :

7. “ This is the state of man : To-day he puts forth
The tender leaves of hope, to-morrow blossoms,
And bears his blushing honors thick upon him ;
The third day comes a frost, a killing frost ;
And—when he thinks, good, easy man, full surely
His greatness is a ripening—nips his root,
And then he falls, as I do.”

8. The sacred writers draw some of their most beautiful imagery from the same sources. What more appropriate pictures of the brevity¹² of human life can be given than these : “We all do fade as a leaf.” “We are like grass which groweth up ; in the morning it flourisheth ; in the evening it is cut down, and withereth.” The righteous are declared to be “like a tree planted by the rivers of water, that bringeth forth his fruit in his season,” and “whose leaf also shall not

wither;" while the ungodly are compared to "an oak whose leaf fadeth, and a garden that hath no water."

9. Solomon, speaking in the person of the coming Savior, says, "I am the *rose* of Sharon, and the *lily* of the valleys." The Savior himself spoke of the righteous as the wheat, and of the wicked as the tares; and he likened¹⁴ the kingdom of heaven to a grain of mustard-seed, which, from the smallest beginning, "becometh a tree, so that the birds of the air come and lodge in the branches thereof." He also taught of the coming of his kingdom from the parable of the fig-tree; and we are told that in the New Jerusalem was the "*tree of life*, whose leaves were for the healing of the nations."

10. Flowers speak a varied language, and reach the heart not only in its seasons of joy, but in its hours of sadness also. Nothing can more forcibly remind us of joys forever fled than the pale, perishing flowers of autumn:

"Pale flowers! pale perishing flowers!

Ye're types of precious things;

Types of those bitter moments,

That flit, like life's enjoyments,

On rapid, rapid wings:

Last hours with parting dear ones

(That Time the fastest spends),

Last tears in silence shed,

Last words half uttered,

Last looks of dying friends." C. B. SOUTHEY.

11. We can hardly conceive of any more natural association of ideas than that which makes a rosebud the emblem of infant loveliness; a full-blown rose the type¹³ of blooming womanhood; and which likens¹⁴ extreme old age to the "last leaf" of autumn, which has survived all its kindred, and now, with the approaching blasts of winter, trembles to its fall. As a fitting illustration of the latter of these emblems, we introduce the following gem from a favorite American poet.

¹ "THEIR COUNSEL," their own secrets.

² AS'PEN, a species of poplar.

³ AS SO-CI-A'-TIONS, connected ideas; or, such a connection of ideas that one naturally suggests or calls up others; as when the leaves of spring remind us of the season of youth, of youthful hopes, etc.

⁴ EM'-BLEMS, pictures or representations.

⁵ SERE, dry; withered.

⁶ IM'-AGE-RY, lively descriptions, in which

one thing represents another, etc.; as the "last leaf" may represent *old age*.

⁷ LIT'-ER-A-TURE, writings; books, etc.

⁸ MYSTIC, hidden; secret.

⁹ PROF'-LI-GATE, a man abandoned to vice.

¹⁰ SI-MIL'-I-TUDE, likeness; resemblance.

¹¹ VI-SI-SI-TUDE, changes.

¹² BREV'-I-TY, shortness.

¹³ TYPE, that which represents something

¹⁴ LIK'-ENS, compares.

[else.

LESSON XI.



THE LAST LEAF.

1. I saw him once before,
As he pass'd by the door',
And again
The pavement stones resound
As he totters o'er the ground
With his cane'.

2. They say that in his prime',
Ere the pruning-knife of Time
Cut him down',
Not a better man was found
By the crier on his round
Through the town'.
3. But now he walks the streets,
And he looks at all he meets
So forlorn';
And he shakes his feeble head,
That it seems as if he said',
"They are gone'."
4. The mossy marbles rest
On the lips that he has press'd
In their bloom';
And the names he loved to hear
Have been carved for many a year
On the tomb'.
5. My grandmamma has said—
Poor old lady'! she is dead
Long ago'—
That he had a Roman nose',
And his cheek was like a rose
In the snow'.
6. And now his nose is thin',
And it rests upon his chin
Like a staff';
And a crook is in his back',
And a melancholy crack
In his laugh'.
7. I know it is a sin
For me to sit and grin
At him here',
But the old three-corner'd hat,
And the breeches—and all that',
Are so' queer'!

8. And if I should live to be
The last leaf upon the tree
 In the spring'—
 Let them smile as I do now'
 At the old forsaken bough'
 Where I cling'.

OLIVER W. HOLMES.

a More solemnity and deeper feeling are expressed by the inflections as here given—the rising on “so,” and the falling on “queer,” than would be if these inflections were transposed. Now the meaning is simply the exclamatory expression, with some *depth* of feeling, “How queer they are!” The inflections transposed would express the more trivial meaning, “They are so queer that I can not help laughing.”

LESSON XII.

THE FOOD OF PLANTS.

1. THE food of plants consists of air and water, and of the various substances dissolved in or mixed with them. By their leaves and roots* plants absorb *water*, which is composed of the two gases oxygen and hydrogen. By the little breathing holes in their leaves they take in carbonic acid, and perhaps some nitrogen also, although the chief source of the latter is the soil. By the varied union of the constituent¹ gases of air and water nearly all the parts of the plant are formed, the solids as well as the liquids.

2. The elements, carbon, hydrogen, and oxygen, are used by the plant, in various proportions, to form woody tissue,² sugar, starch, resin, oils, and acids. Nitrogen, another gas, is also required in small quantities for many vegetable products, especially those used in medicines, and it is found in the most nutritious³ articles of food. But, besides the above, which are called *organic*⁴ elements, some mineral, earthy, and other ingredients,⁵ called *inorganic*⁶ elements, are also used as food, or for some other purpose, by different plants, although in small quantities.†

3. In view of these mineral and earthy matters which most

* The new and very small fibrous roots called *spongioles*, and not the large and old roots, are what absorb moisture or food from the earth. Hence the importance, in transplanting shrubs and trees, of preserving with care these little rootlets.

† Such as potassium, silicon, calcium, phosphorus, iron, sodium, sulphur, iodine, and chlorine. Even *copper* is taken in by the roots of some plants. It is said to form eight parts in a million in coffee, and about four and a half parts in a million in wheat.

plants are found to contain, the eminent German chemist, Liebig, has classified cultivated vegetables, some as *alkali*⁷ plants, of which the potato is an example; some as *lime* plants, among which are peas; some as *silex* or flint plants, which include the grasses; and some as *phosphorus* plants, among which are our grains, wheat, rye, etc. The skin of the ratan palm abounds so much in silex, which the plant has absorbed dissolved in water, that it will strike fire with a piece of steel; the same substance exists in other kinds of wood, to which it gives a peculiarly gritty texture;⁸ and in a plant common in this country, the *equisetum*, or horse-tail, which is used for polishing wood, the whole surface seems to be composed of compact sandy particles.

4. *Carbonic acid gas*, which, as we have elsewhere seen, is very destructive of animal life, and is produced by the breathing of animals and the combustion⁹ or decay of vegetable matter, is the most essential¹⁰ of the substances upon which plants are fed. It is taken into the plant both by the leaves and by the roots. By some mysterious process, which we do not understand, it is there decomposed,¹¹ and, while the carbon is retained to aid in forming the solid parts of the plant, the oxygen is returned to the atmosphere. Here, being breathed by animals, it again meets with its old friend carbon, unites with it, and carbonic acid is again sent forth from animal lungs to supply other vegetables with carbon.

5. Thus, day by day, the whole vegetable world is growing up before our eyes, forming one half of its solid bulk out of a portion of the same air that we breathe—the carbon which it borrows from the atmosphere and from decaying vegetation—while nine tenths of the other half are common water.* Strange though it may seem to us, yet we know that the solid parts of our wooden dwellings, of our ships that sail on the ocean, of our sturdy forest oaks, are formed almost wholly of compressed¹² and hardened air and water. And when the vegetation that robes the summer landscape with beauty falls asleep in the lap of autumn, and when these forests that surround us fall, and put on the change which

* A plant is said to *retain* about one third part of all the water that enters its system, and to change it into a solid form.

we call decay, they merely return to earth and air again, that succeeding generations of vegetable life may feed upon and be clothed with the same materials.

6. Many are the mysteries in vegetable life that we do not understand. It is, indeed, all a mystery. We can not even tell why plants vary in form, and structure,¹³ and modes of growth; why some bask in the sunlight, and others court the shade; why those growing in the same soil, and feeding upon the same air and water, put on different colors; why one converts its juices into poison, and another furnishes a delicious and wholesome beverage. Nor has man been enabled to tell *how*, out of the very same materials, the plant can form different substances—~~how~~ out of carbon, hydrogen, and oxygen, it can form woody fibre, and starch, and gum, and sugar, and also an acid that is in all respects like vinegar.

7. Yet all this the plant accomplishes in its chemical laboratory,¹⁴ with a refinement¹⁵ of skill far beyond what man possesses. Man can not take the elements and combine them as the plant does; they will not unite at his bidding. Yet the chemical processes which the plant performs must not be regarded as the blind operations of Nature; they are strictly in accordance with definite laws which God has given it; and, while we view the results of these laws with admiration and wonder, we should not forget their origin.

8. But, although man can not do what the plant does, he may aid the plant in performing many of its secret operations; by knowing “how plants grow,” he may furnish them food of the right kind, and he may thus cause the landscape to put on a robe of brighter green, the harvests to yield more abundantly, and even the desert and waste places to bud and blossom like the rose.

¹ CON-STIT'-Ū-ENT, forming, composing, or making, as an essential part.

² TIS'-SŪZ, the woody portions, which have the appearance of threads *woven* together.

³ NŪ-TRĒ'-TIŌUS, nourishing.

⁴ OR-GĀN'-ĪC, those used in forming the organs, vessels, etc., of plants.

⁵ IN-GRĒ'-DI-ENTS, the several parts which make up a thing.

⁶ IN-OR-GĀN'-ĪC, not forming part of the organs.

⁷ AL'-KA-LĪ, a substance capable of destroying the effect of an acid.

⁸ TĒXT'-ŪRE, character; formation.

⁹ COM-BŪS'-TION, burning.

¹⁰ ES-SĒN'-TIAL, important.

¹¹ DE-COM-POS'ED, separated into its constituent parts.

¹² COM-PRESS'ED, pressed or brought close together.

¹³ STRŪCT'-ŪRE, internal arrangement of parts.

¹⁴ LĀB'-O-RA-TO-RY, workshop; place for chemical operations.

¹⁵ RE-FĪNE'-MENT, exceeding nicety; great exactness.

LESSON XIII.

THE MYSTERIES OF VEGETATION.

1. WE know not why the beech delights the glade¹
 With boughs extended, and a rounder shade',
 While towering firs in conic² forms arise,
 And with a pointed spear divide the skies';
 Nor why, again, the changing oak should shed
 The yearly honor of his stately head,
 While the distinguished yew is ever seen
 Unchanged in branch, and permanent in green.
2. Wanting the sun', why does the caltha fade'?
 Why does the cypress³ flourish in the shade'?
 The fig, and date, why love they to remain
 In middle station, and an even plain',
 While in the lower marsh the gourd is found,
 And while the hill with olive shade is crown'd'?
3. Why does one climate and one soil endue⁴
 The blushing poppy with a crimson hue,
 Yet leave the lily pale, and tinge the violet blue'?
 Why does the fond carnation love to shoot
 A various color from one parent root,
 While the fantastic⁵ tulip strives to break
 In two-fold beauty and a parted streak'?
4. The twining jasmine', and the blushing rose',
 With lavish grace their *morning* scents disclose';
 The swelling tuberose, and jonquil fair',
 Impart their fragrance to the *evening* air'.
 Whence has the lofty tree, or modest flower,
 A various instinct, or a different power'? [breath',
 Why should one earth', one clime', one stream', one
 Raise *this'* to strength', and sicken *that'* to death'?

PRIOR.

¹ GLADE, an opening in a wood.² CÖN'-ic, tapering upward to a point in the form of a cone.³ Cÿ'-PRESS, an evergreen; the white cedar.⁴ EN-DÛE', clothe; supply with.⁵ FAN-TAS'-tic, gay; gaudy.

LESSON XIV.

PLANTS, THE LUNGS OF CITIES.

1. PUBLIC squares and spacious streets, well set with trees, have been aptly¹ called the *lungs of cities*. It is certain that the two great organized kingdoms of nature—the animal and vegetable—are designed to co-operate² in their mutual development.³ The beautiful Persian fable, which describes the rose and the nightingale as shut up in a crystal cage, and mutually giving life to each other, though not strictly correct as to the action of the *flower*, is forcibly illustrative of the relative actions of animal and vegetable life.

2. In modern *aquaria*⁴ the theory becomes reality, for aquatic plants keep the water in which they grow in a fit state to sustain animal life. It is a fact well known that fishes do not thrive well in reservoirs⁵ destitute of aquatic vegetation. The water of an aquarium need not be changed for weeks or months, if there is a proper proportion of such plants as grow in water. This, then, is the great secret of the aquarium: the plants afford a supply of oxygen to the animals, while the animals supply the plants with the carbon which is indispensable⁶ to their growth.

3. So in the atmosphere. In large cities, where carbonic acid gas is produced in large quantities from the lungs of multitudes of people, and from the great number of fires kept constantly burning, trees act as purifiers, by absorbing the carbonic acid which is poisonous to man, and by restoring to the air the life-supporting oxygen. Throughout all portions of the globe this principle is in constant operation, evincing⁷ the wisdom and goodness of the Deity in thus beautifully harmonizing⁸ the operations of Nature.

¹ ÄPT'-LY, properly; fitly.

² EO-ÖP-ER-ÄTE, act together.

³ DE-VĒL'-OP-MENT, growth; progress to higher forms.

⁴ A-QUÄ'-RI-A (the plural of aquarium), little ponds, or vessels, for rearing water plants with water animals.

⁵ RES-ER-VOIR' (*rez-er-vvor'*), a place where water is kept in store for fountains, etc.

⁶ IN-DIS-PĒN'-SA-BLE, absolutely necessary.

⁷ E-VĪN'-QING, showing; making plain.

⁸ HÄR'-MO-NĪ-ZING, causing to agree.

LESSON XV.

BUDS.



1. A BUD has been called a repetition of the plant on which it grows. It is common to give the name *bud* to that scaly envelope¹ which contains the rudiments² of a new plant; but such scales are not required to form a bud, except in cold climates.



2. The first appearance of a young branch or flower is the bud, and a new and independent plant is contained in it, as much as in a seed. Buds not only terminate growing branches, but appear in what are termed *axils*, or the acute angles formed by the leaves and the stem. From the buds spring branches, which are in all respects like the main stem, and which present an arrangement similar to the leaves.

3. Many buds are never fully developed,³ but seem to have been produced as a resource⁴ in case of the destruction of any. Thus, if the terminal⁵ bud be destroyed, lateral⁶ buds, that otherwise would have remained undeveloped, put forth shoots, and the growth of the plant is scarcely checked. It is on this principle that hedges are thickened by trimming off the tops, a process well known to gardeners.

4. Irregular buds often appear in stems gorged⁷ with sap. The rich and much admired grain known as bird's-eye maple is attributed to the numerous buds which have appeared from time to time during the growth of the tree. Frequently two buds appear, side by side, instead of one, owing to an excess of nutritious⁸ sap.

5. Thorns are supposed to result from an imperfect growth of what should have been branches or stems. It is well known that many plants, which in a wild state abound in thorns, become free from them by cultivation. In such cases

the increased supply of nourishment afforded the plant by better tillage enables the buds to become branches instead of thorns. *Thorns* are of woody structure, and grow from the branch or stem; while *prickles* only grow from the bark, and may be peeled off with it, as will appear by stripping the bark from a rose-bush.

6. It should be mentioned here that, as a leaf-bud is really a separate and complete plant in itself—like the parent plant on which it grows—if the leaf-bud can be transferred⁹ to another plant, and made to take root in and grow upon it, it will produce a stem having the same qualities as the parent plant from which it was taken. Thus, if a leaf-bud from a greening apple-tree be transferred⁹ to another tree, and made to grow upon it, it will produce the same kind of apples as its parent stem.

7. But if the *seed* of a greening apple be planted, and grow and produce fruit, it will, indeed, bear apples, but it is uncertain what kind of apple; it may be sweet or sour, a russet or a pippin, or perhaps some new kind not before known. It is from *seeds* alone that new kinds can be produced. But if any particular kind of plant is to be multiplied,¹⁰ it can only be done by aid of its leaf-buds—by planting the stems which spring from them, or by the common gardening operations of *budding* and *grafting*.

8. It is only plants whose fruit is of a like general character that can be mutually transferred in this way. The buds of the pear, the crab-apple, the common apple, and the quince, can be made to grow each upon the others; but an apple will not grow upon a peach-tree or a cherry-tree. The process of budding and grafting was known and practiced as long ago as the days of Virgil.

9. But various are the ways to change the state
Of plants; to bud,¹¹ graft,¹² and inoculate.¹¹
For where the tender rinds¹³ of trees disclose¹⁴
Their shooting germs, a swelling knot there grows;
Just in that place a narrow slit we make,
Then other buds from bearing trees we take;
Inserted thus, the wounded rind we close,
In whose moist folds the infant budlet¹⁵ grows.

10. But when the smoother stem from knots is free,
 We make a deep incision¹⁶ in the tree,
 And in the solid wood the slip inclose;
 The foster-plantlet¹⁷ shoots again and grows;
 And in short space the laden boughs arise,
 With happy fruit advancing to the skies.
 The mother plant admires the leaves unknown
 Of alien¹⁸ trees, and apples not her own.

VIRGIL, *Georgic* ii.

¹ EN'-VEL-ŌPE, an inclosing cover.

² RŪ'-DI-MENTS, beginnings; first principles.

³ DE-VĒL'-OPEd, unfolded; fully grown.

⁴ RE-SŌURCE', a resort when others fail.

⁵ TĒRM'-IN-AL, growing at the end.

⁶ LĀT'-ER-AL, growing at the side.

⁷ GŌRĠED, filled; glutted.

⁸ NŪ-TRĪ'-TIOUS, nourishing.

⁹ TRANS-FĒR'RED TO, conveyed to.

¹⁰ MŪL'-TI-PLĪED, increased.

¹¹ "TO BUD," or "to IN-ŌC'-U-LATE," is to insert the bud of one plant or tree in or under the bark of another.

¹² "TO GRAFT" is to insert a small shoot or cutting. It is generally done by cutting off a stem, splitting it, and inserting the shoot in the cleft.

¹³ RĪND, bark; outer covering.

¹⁴ DIS-ŌLŌSE', show.

¹⁵ BŪD'-LET, a little bud.

¹⁶ IN-ŌIS'-ION, a cut; gash; slit.

¹⁷ "FŌS'-TER-PLANT'-LET," a little plant that grows on a stem that is not its parent stem.

¹⁸ ĀL'-IEN, foreign.

LESSON XVI.

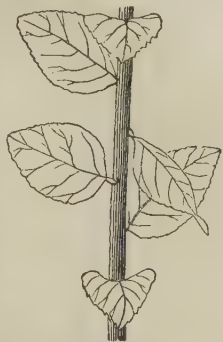
LEAF ARRANGEMENT.

1. THE laws by which leaves are arranged on the stem apply also to the arrangement of branches and thorns, as the latter arise from buds in the axils¹ of the leaves. This is one of the most interesting divisions of Botany, especially when the very law that regulates the position of leaves, twigs, and branches is found to prevail in the arrangement and revolutions of the planetary worlds, thus plainly indicating that the same Being who clothed the lilies of the field in beauty surpassing the regal² splendor of Solomon, "made the stars also."

2. In the arrangement of leaves even mathematical precision is manifest. Observe the leaves of grass, how one is over one side of the stem, and the next on the opposite side, while the third comes directly over the first, and the fourth over the second. When each leaf is thus *one half* way round, the arrangement is called *alternate*. In sedges, and in that pest³ of farmers and gardeners called nut-grass, each leaf is *one third* the way round the stem from the one below it.

3. Cherry and apple trees have the leaves and twigs *two*

fifths of the way round, reckoning from any leaf to the one above it—that is, *five* leaves appear in a spiral⁴ of two revolutions round the stem, and the *sixth* leaf, which is exactly above the first, commences a new series. In the holly, and a large number of trees, it may be seen that from one leaf to another directly above there are eight spaces between leaves, and that a spiral line passing through the bases⁵ of the leaf-stems will make just three turns. In this arrangement the leaves are *three eighths* of the circumference of the stem from each other.



Arrangement of the Leaves
of the Cherry.

4. In wormwood the leaves are *five thirteenth*s of the circumference apart; in cones of some species of pine-trees *twenty-one* leaves are found in a spiral of eight turns, while in others the leaf distances are *thirteen thirty-fourths* of the circumference. With a few exceptions, which perhaps may have arisen from the failure of some leaf-germs to be developed, the leaves of each species of plant are arranged at regular distances from each other around the stem, although these distances vary in different species. Even in fruits, as in the protuberances⁶ of the pine-apple, this beautiful order is apparent. The plan seems to have been, amid great diversity⁷ of position, to give to each leaf its proper share of air and light, which would not have been attained by a miscellaneous⁸ arrangement.

5. It thus appears that the leaves of plants do not take positions as if by chance, starting out here and there at random, but, making their appearance in the lines of regular revolving spirals, they obey definite laws in their arrangement. What is still more curious, a law in all respects similar appears to extend to the solar system itself, and to govern the revolutions of the heavenly bodies; for the same numbers that express the relative distances in the arrangement of leaves of different species around their central stem, denote very nearly the relative times of the revolutions of the planetary worlds around their central sun.

6. Thus, regarding Neptune as the most distant of the planets, we find that Uranus,⁹ the next in order, revolves around the sun, to speak in round numbers, in *one half* of the time of Neptune; Saturn in *one third* of the time of Uranus; Jupiter in *two fifths* of the time of Saturn; the Asteroids, which supply the place of a missing planet, in *three eighths* of the time of Jupiter; and so on down to Mercury, the planet nearest the sun, whose time of revolution is not far from *thirteen thirty-fourths* of that of Venus, its nearest neighbor.

7. These numbers singularly correspond with those which denote the relative distances of the leaves of different species of trees, shrubs, and herbs, in their spiral revolutions around the central axis¹⁰ of their orbits.¹¹ When we find the measures used in scanning "the plants, the poetry of earth," and "the stars, the poetry of heaven," to be the same, shall we doubt that one designer planned the whole?*

¹ AX'-IL, the angle, on the upper side, formed by a branch with a stem or leaf.

² RE'-GAL, kingly; royal.

³ PEST, plague; any thing very troublesome.

⁴ SPI'-RAL, a line that winds like a screw.

⁵ BA'-SES, plural of *bā'-sis*, lower ends; that on which they rest.

⁶ PRO-TU'-BER-AN-ES, the little knobs or bunches.

⁷ DI-VERS'-I-TY, variety.

⁸ MIS-CEL-LA'-NE-OUS, irregular; without rule.

⁹ U'-RA-NUS.

¹⁰ AX'-IS, plural *ax'-es*, the central part of a stem; that around which any thing revolves.

¹¹ ORB'-IT, the path or track of a revolving body.

* EXPLANATORY NOTE.—The following fractions show the distances around the stem from one leaf to another, in different species of plants:

$$\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{8}, \frac{5}{13}, \frac{8}{21}, \frac{13}{34}, \frac{21}{55}.$$

In the third fraction in the series, 2 revolutions give 5 leaves; in the fourth, 3 revolutions give 8 leaves, and so on. It will be seen that the sum of any two consecutive numerators gives the next numerator. The same is also true of the denominators. The value of each fraction after the second is between $\frac{1}{2}$ and $\frac{1}{3}$.

Neptune..... 60,000 days.

Uranus..... 30,000 " = $\frac{1}{2}$

Saturn 10,000 " = $\frac{1}{3}$

Jupiter..... 4,000 " = $\frac{2}{5}$

Asteroids (near). 1,500 " = $\frac{3}{8}$

Mars..... 600 " = $\frac{5}{13}$

Earth 365 " = $\frac{8}{21}$

Venus 224 " = $\frac{13}{34}$

Mercury..... 88 " = $\frac{21}{55}$

In the adjoining table the time of revolution of the planets is given in approximate or round numbers, and also the fraction or ratio of the time of one planet to the time of the one exterior to it.

It will be seen that these fractions, which nearly represent the ratio of planetary periodical revolutions, are the same as those which represent the law of *Phyllotaxis*, or *Leaf Arrangement*. The break in the series at the Earth, where the ratio eight twenty-one is that of the year of Venus to the year of Mars, will be best explained in a subsequent article on Astronomy.

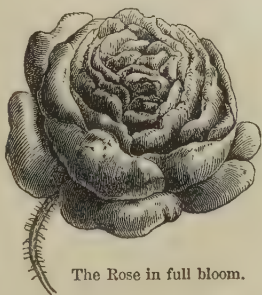
LESSON XVII.

VEGETABLE REPRODUCTION.—FLOWERS.

1. "God might have made the earth bring forth
Enough for one and all,
The oak-tree and the cedar-tree
Without a flower at all.
2. "He surely might have made enough
For every want of ours—
For luxury, medicine, and toil—
And yet have made no flowers."

3. These verses by Mrs. Howitt are very pretty, and, in a certain sense, very true; but, while it is admitted that God *might* have made and propagated¹ the oak-tree and the cedar-tree without flowers, it is manifest² that he has not chosen to do so.

4. We read that, by Divine command, "the earth brought forth grass, and herb yielding seed after his kind, and the tree yielding fruit, whose seed was in itself, after his kind." The organs³ especially designed to secure the multiplication or propagation of plants are the *flower*, *fruit*, and *seed*; and they depend on each other in the order in which they are named.



The Rose in full bloom.

5. It is true that plants are often multiplied by separation of shoots or buds, which, being complete in themselves, constitute an individual plant. Many leaves, as those of the orange and fig, may be separated from their stems, and, if carefully placed in the earth by their petiole⁴ or leaf-stalk, will take root and produce new plants. Dahlias,⁵ potatoes, and tulips are propagated from tubers or bulbs; roses, vines, etc., by cuttings or slips placed in earth; and apples, pears, and quinces by grafting or budding. This is, however, rather vegetable continuation and multiplication than reproduction.⁶

6. The flower, which Pliny fancifully called "the joy of the trees," is a peculiar kind of branch, consisting of a peculiar kind of leaves; and, whatever the laws are of the arrangement of branches with respect to each other, the same will regulate the arrangement of flowers. A leaf-bud, starting in all respects apparently like its fellows, becomes changed by some cause of which we are ignorant, although supposed to be by an increased supply of nutriment,⁷ and thus what would otherwise have been a branch or a leaf becomes a flower, perhaps of exceeding beauty in coloring, fragrant in odors, and producing a fruit luscious⁸ to the taste. Similar and equally important changes, which will be hereafter noticed, take place in other departments of Natural History.

7. A complete flower consists of four parts, or series of organs, viz., cālyx, corolla,⁹ stāmens, and pistil. (See Fig. 15.) The two former are rather ornamental than essential, as a flower, botanically speaking, can consist of stamens and pistil alone. Stāmens and pistils are the essential¹⁰ organs of a flower; but sometimes there is only one of these present, the other organ being in another blossom on the same plant, as in the Indian corn, where the ear is but half a flower, having for pistils what we commonly call the silk, while the tassel is the other half, containing the stāmens.

8. This mode of flowering is seen in many forest trees, as the oak, beach, chestnut, birch, and walnut. Frequently, also, one half of the flower, or the blossom with one essential organ, is on one plant, and the other organ on another plant.

Fig. 15.

The several Parts of a complete Flower.

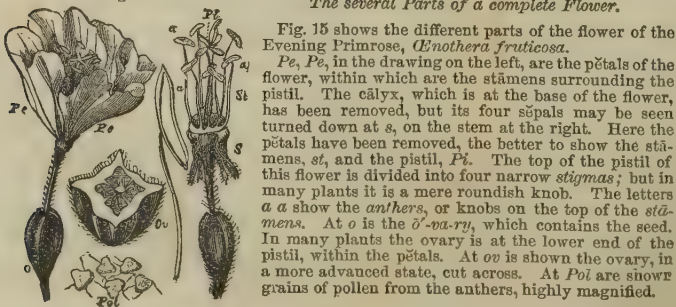


Fig. 15 shows the different parts of the flower of the Evening Primrose, *Oenothera fruticosa*.

Pe, Pe, in the drawing on the left, are the petals of the flower, within which are the stāmens surrounding the pistil. The cālyx, which is at the base of the flower, has been removed, but its four sepals may be seen turned down at s, on the stem at the right. Here the petals have been removed, the better to show the stāmens, st, and the pistil, Pi. The top of the pistil of this flower is divided into four narrow stigmas; but in many plants it is a mere roundish knob. The letters a a show the anthers, or knobs on the top of the stāmens. At o is the ō-va-ry, which contains the seed. In many plants the ovary is at the lower end of the pistil, within the petals. At ov is shown the ovary, in a more advanced state, cut across. At Pol are shown grains of pollen from the anthers, highly magnified.

This is the case with the hop, hemp, willow, prickly-ash, and red cedar.

9. The *cālyx*, which forms the outermost part of a complete flower, consists of one or more leaves, called *sēpals*. Sepals are generally of a green color, and are arranged around the lower part of the flower. The term *cālyx*, or *cup*, itself indicates its position to any one who can recall to mind the appearance of a rose-bud.

10. The corolla, which is in common language called the flower, consists of one or more leaves, termed *pētals*. Pētals are really leaves; but they differ from leaves constituting foliage much more than sepals. They are seldom green, but present¹¹ the most brilliant colors, and perform but to a very limited extent, if at all, the breathing processes described under the head of *leaves*.

11. Corollas are mon-o-pet'-al-ous or pol-y-pet'-al-ous—that is, they have one pētal or more than one, according as they consist of one or more leaves. Beyond this distinction flowers are variously shaped, presenting to the eye a diversity as interesting in form as in color. Among the mon-o-pet'-al-ous, or one-leaved corollas, we find those that spread out the divisions of their pētal in the form of a salver, others that diverge like the spokes of a wheel; some that, like the morning-glory, are shaped like a tunnel; some that are bell-formed; and others that, like the sage and snapdragon, are called *labiate*, or lip flowers, from their resemblance to the lips and mouth of animals.

12. The poly-pet'-al-ous, or many-leaved corollas, exhibit a still greater variety of forms. Among these may be mentioned those which, like the pea-blossom, are said to be butterfly-shaped, because they resemble the wings of a butterfly; those which resemble the lily, the rose, or the pink; those which are bell-formed, and salver-shaped, and wheel-shaped; and those which, as the cabbage, mustard, turnip, and wall-flowers, are called *cross-shaped*, because their four pētals are in the form of a cross. The seeds of all plants which have cross-shaped corollas are arranged in a kind of pod; and they are distinguished from other seeds by containing sulphur, the chemical effect of which is seen when a silver spoon is used

with mustard. The names of the principal forms of flowers are given in the explanation below.

13. But, besides those which have been mentioned, there are many very irregular flowers, such as the violet, columbine,¹² and nasturtion. Formerly the term *nectary* was applied to pětals of unusual shape, especially when the flowers were much frequented by bees; but this term is not now used by botanists as applicable to any distinct organ or part. Sometimes the general term *perianth*¹³ is given to the leaves of a flower when they are not readily distinguished as sēpals or pětals.

14. We know not the causes which dispose¹⁴ the parts of some buds to become sēpals, pětals, etc., while others become leaves; but a flower is always prepared in the centre of a bud, or embosomed among its leaves a long time before they expand. In general a flower is formed rapidly, a few months at most being sufficient to pass it through all its stages of growth. In certain *palms*, however, some years appear to be required; and it is said that the rudiments¹⁵ of a flower may be discovered in the bud of a palm as many as seven years, in some instances, before the perfect flower expands.¹⁶

15. While annuals¹⁷ flower in a few weeks after their seeds are sown, biennials¹⁸ demand some months, perennials¹⁹ a longer time, and trees several years. Some, again, blossom in the winter, as the Christmas rose and the fragrant geranium; others in the earliest spring, as the snowdrop and the crocus; while others can not be made, by any known artificial means, to advance their time of flowering even a few weeks.

16. A great difference is also observable in the hours at

The principal Forms of Flowers, with their Names.



1. The flower called Phlox is salver-shaped; the botanical term for which is *hy-po-cra-ter'-i-form*. 2. Woody Nightshade; wheel-shaped, or *rot'-late*. 3. Tobacco; funnel-shaped, or *in-fun-dib'-ū-li-form*. 4. Canterbury Bell; bell-shaped, or *cam-pan'-ū-late*. 5. Mustard; cross-shaped, or *crū'-ci-form*. 6. Pink; pink-shaped, or *car-ri-o-phyll-lā'-ceous*. 7. Lily; lily-like, or *lil-i-ā'-ceous*. 8. Catnip, Sage, etc.; lip-shaped, or *lab'-bi-ate*. 9. Pea, Bean, etc.; butterfly-shaped, or *pa-pil'-io-nā'-ceous*.

which they open their blossoms. One expands at dawn of day; another species a few hours later; a third at midday; some in the early evening; and others, like the night-blooming cereus, when darkness has established her dominion. Hence what are called the *watches*, or *dials of the flowers*, have been constructed—tables in which every hour of the day is filled up by the opening of some flower.

17. "Twas a lovely thought to mark the hours,
As they floated in light away,
By the opening and the folding flowers,
That laugh to the summer's day.

"Thus had each moment its own rich hue,
And its graceful cup and bell,
In whose color'd vase might sleep the dew,
Like a pearl in an ocean shell."

HEMANS.

18. In all their vast variety of size, and form, and color; in the various odors which they exhale;²⁰ in their wide dispersion throughout all climes; in their periods of repose; in their hours and seasons of blossoming and decay; and in their very frailty, flowers speak to the heart a varied language—a language that appeals to every condition and circumstance in life; they are full of instruction; and they cheer man's pathway from the cradle to the grave.

- | | |
|--|---|
| 1 PROP'-A-GĀ-TED, caused to multiply or increase. | 11 PRE-SENT', offer to the eye. |
| 2 MAN'-I-FEST, plain; evident. | 12 COL'-UM-BINE. |
| 3 OR'-GANS, the parts which perform the offices mentioned. | 13 PER'-I-ANTH; it means, "about the flower." |
| 4 PET'-I-OLE, the foot-stalk of a leaf. | 14 DIS-PŌSE', cause or occasion. |
| 5 DĀH'-LIA (dahl'-yah). | 15 RŪ'-DI-MENTS, the beginnings; germs. |
| 6 RĒ-PRO-DUC'-TION, the act of producing anew. | 16 EX-PANDS', opens. |
| 7 NŪ'-TRI-MENT, food; that which nourishes. | 17 AN'-NŪ-ALS, plants that live but one summer. |
| 8 LUS'-CIOUS (lush'-us), delicious. | 18 BĪ-EN'-NI-ALS, that continue two years. |
| 9 EO-BOL'-LA, the flower-leaves. | 19 PER-EN'-NI-ALS, that continue more than two years. |
| 10 ES-SEN'-TIAL, necessary; those which constitute the flower. | 20 EX-HĀLE', send forth; emit. |

LESSON XVIII. H

HYMN TO THE FLOWERS.

1. YE bright mosaics'!¹ that with storied² beauty
The floor of Nature's temple tessellate',³
What numerous emblems of instructive duty
Your forms create'!

2. 'Neath cloistered⁴ boughs, each floral bell that swingeth
And tolls its perfume on the passing air',
Makes Sabbath in the fields', and ever ringeth
A call to prayer';
3. Not to the domes⁵ where crumbling arch and column
Attest⁶ the feebleness of *mortal* hand',
But to that fane,⁷ most catholic⁸ and solemn,
Which *God* hath planned';
4. To that cathedral,⁹ boundless as our wonder,
Whose quenchless lamps the sun and moon supply',
Its choir¹⁰ the winds and waves', its organ thunder',
Its dome' the sky'.
5. There, as in solitude and shade I wander
Through the green aisles,¹¹ or, stretched upon the sod,
Awed by the silence, reverently ponder¹²
The ways of God'—
6. Your voiceless lips, O flowers! are living preachers',
Each cup a pulpit', and each leaf a book',
Supplying to my fancy numerous teachers
From loneliest nook.¹³
7. Floral apostles'!¹⁴ that in dewy splendor
“Weep without woe, and blush without a crime’,”
O may I deeply learn, and ne'er surrender,
Your lore¹⁵ sublime.
8. Were I, O God'! in churchless lands remaining',
Far from all voice of teachers or divines',
My soul would find, in flowers of thy ordaining',
Priests, sermons, shrines'.

HORACE SMITH.

¹ MO-SA'-ICS, a collection of little pieces of glass, marble, etc., of various colors, joined together so as to represent the colors of painting. The *flowers* are here called *mosaics*.

² “STÖ'-RIED BEAU'-TY” (stō'-rid), a beauty that speaks; furnished with stories.

³ TES'-SEL-ÂTE, cover with a mosaic work of flowers.

⁴ CLOIS'-TERED, pertaining to a monastery; secluded.

⁵ DÖMES, cathedrals; places of worship.

⁶ AT-TEST', show; prove; make plain.

⁷ FÂNE, a temple; a place of worship.

⁸ CATH'-O-LIC, liberal; designed to embrace all; not bigoted.

⁹ CATH'-EDRAL, a grand church or place of worship.

¹⁰ CHOIR (quière), a collection of singers in a church.

¹¹ AISLES (îles), walks or passages in a church.

¹² PON'-DER, think of; reflect upon.

¹³ NOOK, a corner.

¹⁴ A-POS'-TLES (a-pos'-ls), preachers.

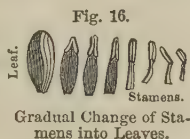
¹⁵ LÖRE, learning; lessons; instruction.

LESSON XIX.

VEGETABLE REPRODUCTION—*Continued.*

STAMENS, PISTIL, FRUIT, AND SEEDS.

1. THE STĀMENS are situated, in a complete flower, next within the corolla. A perfect stāmen consists of two parts, anther and filament. The former is analogous¹ to the blade of a leaf, and the latter to the stem. In some cases stāmens are changed into pē-
tals by cultivation, as is seen when what are called single flowers become double. The common white pond-lily affords a good illustration² of the change of stāmens into pē-
tals. The same may be traced in double roses, buttercups, and most double flowers.



2. The top of the stāmen, called the *anther*, is almost always yellow, and contains a yellow powder, called *pollen*, which, falling upon the pistil, presently to be described, causes the development³ of the germs and the formation of the seed. When the stāmens and the pistil grow on different plants, each forming only half of a perfect flower, it is necessary that the plants should grow near each other, so that the pollen, wafted by the wind, may reach the other half of the flower, or no seed will be formed.

3. The PISTIL occupies the centre of the flower, being surrounded by the stāmens and pētals. Its parts are three, *ovary*, *style*, and *stigma*. The *ovary* occupies the lower part, and incloses a cavity in which the germs of the seed are developed, and finally matured into *fruit*. The *style* is usually in the form of a slender thread or column, tapering up from the ovary. The *stigma*, which is the upper part or termination of the style, receives the pollen from the anthers, and communicates⁴ with the germ through a tube in the style.

4. The term FRUIT is much more extensive in its application, speaking botanically, than in common language. The name is given to the enlarged ovary containing the seed, and consists of two parts, the seed and its covering. Fruits, like flowers, exhibit a great variety of forms; for, while some are

soft and fleshy, others are hard and stone-like, and some are dry; some grow in irregular masses, like the blackberry, and others in a multiple⁵ form, like the mulberry and the pinecone.

5. The SEED is the reservoir⁶ of the most nutritious part of the vegetable, often containing twenty times more nourishing material than any other part of the plant. As might therefore be expected, a great portion of the food of man and animals consists of seeds. The quantity of Indian corn raised annually in the United States is about six hundred million bushels, and probably there is an equal quantity of other grains. Besides, large quantities of seeds are raised for the purpose of making various oils. In fact, the farmer is mainly engaged in collecting a practically useful herbarium⁷ within his barns and granaries; and he ought, of all men, to feel an interest in botanical knowledge.

6. The value of agricultural products in the United States for the year 1850 was estimated at one billion six hundred million dollars, all of which came out of the earth or its atmosphere in the form of vegetation. It is true that wool, live-stock, milk, and butter, are included; but the whole passed through the laboratory⁸ of vegetable life. About five hundred million dollars worth of the above products was composed of various seeds or grains. The land cultivated to produce such an enormous product was less than one hundred million acres.

7. The periods of germination⁹ of seeds are various. Some, as oats, rye, and wheat, will germinate, under favorable circumstances, in a single day; while mustard, turnip, and the bean require three days. Lettuce requires four days; melon and cucumber seeds germinate in five days, barley in seven, cabbage in ten, and parsley in fifteen days. The almond and peach require a year; and many seeds of trees do not germinate under two years.

8. The *vitality*¹⁰ of seeds is wonderful. It has been related, and extensively copied, that healthy plants of wheat have been raised from grains found in a mummy case not less than three thousand years old. A recent and valuable book asserts that, "had the wheat crop been at any time entirely

destroyed, this invaluable grain would have been restored to us from seeds preserved for more than three thousand years in the folds of an Egyptian mummy." But Prof. Asa Gray, an eminent American botanist, says "that the asserted cases of such germination⁹ will not bear examination; and that those best qualified to judge utterly disbelieve not only the asserted fact, but also the possibility of any such occurrence."

9. At the Dublin meeting of the British Association, Dr. Steel stated that he had planted many seeds obtained from Egyptian mummies, but always failed to obtain any indications¹¹ of their vitality.¹⁰ But Dr. Moore, of the Dublin Botanic Garden, related an instance in which he had succeeded in producing a new species of leguminous¹² plant from the seeds obtained from a vase discovered in an Egyptian tomb.

10. It is not certain that the seeds planted by Dr. Moore were as old as he supposed, but it is well known that the seeds of leguminous¹² plants, such as beans and peas, will retain their vitality¹⁰ about fifty years, and that various seeds of grasses germinate⁹ after a period of eight years. Seeds packed in air-tight cans soon lose their vitality. They seem to keep best wrapped up in brown paper, or other porous¹³ material.

11. It is often related that strange plants spring up in earth that has been removed from far below the surface in digging wells. One instance which has found its way into the books is the following. In Maine, some well-diggers were sinking a well at a distance of forty miles from the sea; when at the depth of twenty feet they found a stratum¹⁴ of sand, similar to that of the sea-beach, but unlike any known in the vicinity of the well.

12. The sand was scattered about on the soil, and in a year or two a great number of small trees appeared where the sand had been strewn.¹⁵ The trees were different from any growing in the neighborhood, but like trees growing on the sea-shore. It was supposed that these trees, known as the beach plum, must have sprung up from seeds which were in the stratum¹⁴ of sea-sand, and had remained dormant¹⁶ till brought to the surface.

13. At a meeting of the British Association, Dr. Cleghorn stated that after the burning or clearing of a forest in India,

invariably there sprung up a new set of plants, before unknown in that locality. It is well known, also, that in many parts of this country, when recent forest clearings are burned over, there soon springs up a peculiar grass not previously found in the vicinity. How came the seeds there? where did they dwell before the clearing? That the embryo¹⁷ plant should survive so long as well-authenticated facts establish, is truly wonderful, though perhaps it is no more wonderful than that it should exist at all. The following lines beautifully express the mysteries of seed life.

14. "Mark our ways, how noiseless
All, and sweetly voiceless,
Though the March winds pipe¹⁸ to make our passage clear;
Not a whisper tells
Where our small seed dwells,
Nor is known the moment green when our tips appear.
We thread the earth in silence,
In silence build our bowers,
And leaf by leaf in silence show, till we laugh atop sweet flowers."

15. The same writer, in comparing flowers with *fables*, which are instructive and amusing stories, gives the preference to the former, as they are not only more true, and equally loved, but they spring up by every old pathway, and are "marvels sweet forever."

- "O! true things are fables,
Fit for sagest tables,
And the flowers are true things, yet no fables they;
Fables were not more
Bright, nor loved of yore;
Yet they grew not, like the flowers, by every old pathway;
Grossest hand can test us,
Fools may prize us never,
Yet we rise, and rise, and rise—marvels sweet forever."

LEIGH HUNT.

¹ A-NAL'-O-GOUS, similar to; like.

² IL-LUS-TEA'-TION, explanation.

³ DE-VEL'-OP-MENT, opening; unfolding; growth.

⁴ "COM-MŪ'-NI-CĀTES WITH," has the means of passing to.

⁵ "MŪL'-TI-PLE FORM," in series of uniform numbers.

⁶ RES-ER-VOIR', store-house; receptacle.

⁷ HEB'-BĀ'-RI-UM, a collection of dried plants.

⁸ LĀB'-O-RA-TO-RY, a workshop; place for chemical operations.

⁹ GER-MI-NĀ'-TION, the act of sprouting.

¹⁰ VI-TAL'-I-TY, power of maintaining life.

¹¹ IN-DI-CĀ'-TIONS, signs; tokens.

¹² LE-GŪ'-MI-NOUS, pod-bearing.

¹³ PŌ'-ROUS, loose; open; having pores or small openings.

¹⁴ STRĀ'-TUM, a thin layer.

¹⁵ STREWN (pronounced strūn).

¹⁶ DŌR'-MANT, in a sleeping state.

¹⁷ ĒM'-BRY-O, pertaining to the rudiments or beginnings of any thing.

¹⁸ PIPE, whistle.

LESSON XX.



FLOWERS, THE STARS OF EARTH.

1. Spake full well, in language quaint¹ and oiden,
One who dwelleth by the castled Rhine,
When he called the flowers', so blue and golden',
Stars', that in earth's firmament do shine.
2. Stars they are, wherein we read our history,
As astrologers² and seers³ of eld;⁴
Yet not wrapped about with awful mystery,
Like the burning stars which *they* beheld'.
3. Wondrous truths, and manifold⁵ as wondrous,
God hath written in those stars above;
But not less in the bright flowerets⁶ under us
Stands the revelation⁷ of his love.
4. Bright and glorious is that revelation,
Writ all over this great world of ours—
Making evident our own creation,
In these stars of earth, these golden flowers.

5. Every where about us are they glowing—
Some, like stars, to tell us spring is born;
Others, their blue eyes with tears o'erflowing,
Stand, like Ruth, amid the golden corn.
6. Not alone in Spring's armorial⁸ bearing,⁹
And in Summer's green-emblazoned¹⁰ field,
But in arms of brave old Autumn's wearing,
In the centre of his brazen shield;
7. Not alone in meadows and green alleys,
On the mountain top, and by the brink
Of sequestered¹¹ pools in woodland valleys,
Where the slaves of Nature stoop to drink;
8. Not alone in her vast dome of glory,
Not on graves of bird and beast alone,
But in old cathedrals, high and hoary,
On the tombs of heroes carved in stone;
9. In the cottage of the rudest peasant;
In ancestral homes, whose crumbling towers,
Speaking of the Past unto the Present,
Tell us of the ancient Games of Flowers.
10. In all places, then, and in all seasons,
Flowers expand their light and soul-like wings,
Teaching us, by most persuasive reasons,
How akin¹² they are to human things.
11. And with childlike, credulous¹³ affection,
We behold their tender buds expand—
Emblems¹⁴ of our own great resurrection,
Emblems of the bright and better land.

LONGFELLOW.

¹ QUĀINT, odd; strange.² AS-TRŪL/-O-GER, one who pretends to foretell events by the appearances of the stars.³ SERES, prophets.⁴ ELD, olden times.⁵ MĀN/-I-FŌLD, various; many in number.⁶ FLOW'-ER-ETS, little flowers.⁷ REV-R-LĀ'-TION, the act of making known to others what was unknown to them.⁸ AR-MŌ/-RI-AL, belonging to or having the appearance of armor.⁹ BEĀE'-INGS, the figures on armor, or on coats of arms.¹⁰ F'M-BLĀZ/-ONED, adorned with armorial figures.¹¹ SE-QUES'-TERED, secluded; retired.¹² A-KĪN', like; related.¹³ ĆRED'-U-LOUS, easily believing.¹⁴ EM'-BLEMS, pictures or representations.

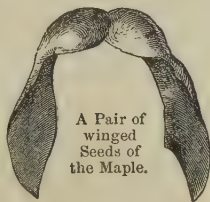
LESSON XXI.

DISPERSION OF SEEDS.

1. THERE are many curious provisions¹ for the dispersion of seeds, the evident design of which is that no portion of the earth shall be destitute of vegetation. Many seeds, like those of the maple, are *winged*, or furnished with lateral² expansions³ to catch the wind, and thus are blown to places remote⁴ from where they grew. The small seed of the dandelion is carried by a long and light stem, at one end of which numerous feathery fibres spread out like an umbrella. The down of this-
 tles, which floats so easily in the air, carries the seed to great distances.



Seed of the Dandelion.



A Pair of winged Seeds of the Maple.

2. Some seeds, having a shelly or an oily covering that can resist the action of water, are borne by the waves to the distant islands of the sea. Many seeds are destroyed, but the number produced is beyond conjecture. A single stalk of tobacco may produce one hundred and sixty thousand seeds; and an elm-tree has been estimated to have more than six hundred thousand.

3. There is, apparently, a prodigality⁵ of flowers and seeds. It is believed by physiologists⁶ that those parts of the fungi⁷ or flowerless plants, such as rust, mildew, and mushrooms, which answer to the seeds of other plants, are universally diffused through the atmosphere, ready to vegetate⁸ whenever an opportunity presents itself, and that every fungus plant may produce not less than ten million germs. The vast extent of vegetable life, and the care which Nature has taken for its preservation, are thus happily described by an English poet:

4. "Then spring the living herbs, profusely wild,
 O'er all the deep green earth, beyond the power
 Of botanist to number up their tribes,
 Whether he steals along the lonely dale,"⁹

In silent search, or through the forest, rank
 With what the dull incurious¹⁰ weeds account,¹¹
 Bursts his blind way; or climbs the mountain rock,
 Fired¹² by the nodding verdure of its brow.
 5. With such 'a liberal hand has Nature flung
 Their seeds abroad, blown them about in winds,
 Innumerable¹³ mixed them with the nursing mould,
 The moistening current, and prolific¹⁴ rain.

The kind, impartial care
 Of Nature naught disdains; thoughtful to feed
 Her lowest sons, and clothe the coming year,
 From field to field, the feathered seeds she wings."

THOMSON.

6. Birds, beasts, and insects aid in the dispersion of seeds, so that whether a Delos¹⁵ rises in a night from beneath the waters, or the coral terraces¹⁶ "spring up to the crested wave," it is but a short time before

"The turf looks green where the breakers¹⁷ rolled,"
 and the recent island is fitted for the habitation of man.

7. "Seeds to our eyes invisible, will find
 On the rude rock the bed that fits their kind.
 There in the rugged soil they safely dwell,
 Till showers and snows the subtle¹⁸ atoms swell,
 And spread th' enduring foliage; then we trace
 The freckled flower upon the flinty base;
 These all increase, till in unnoted years
 The stony tower as gray with age appears,
 With coats of vegetation thinly spread,
 Coat above coat, the living on the dead.
 These then dissolve to dust, and make a way
 For bolder foliage, nursed by their decay:
 The long-enduring ferns in time will all
 Die and depose their dust upon the wall;
 Where the wing'd seed may rest, till many a flower
 Shows Flora's¹⁹ triumph o'er the falling tower."

¹ PRO-VĪ'-SIONS, things provided.

² LĀT'-ER-AL, proceeding from the side, as the wings of the maple seed.

³ EX-PĀN'-SIONS, parts that spread out.

⁴ RE-MŌTE', distant.

⁵ PROD-I-GĀL'-I-TY, needless abundance.

⁶ PHYS-I-ŌL'-O-GIST, one acquainted with the science of plants and animals.

⁷ FŪN'-ĜĪ, the plural of fūn'-gus.

⁸ VĒG'-E-TĀTE, to sprout; grow like a plant.

⁹ DĀLE, a vale; place between hills.

¹⁰ IN-CŪ'-RI-OUS, inattentive; not having curiosity.

¹¹ AC-COUNT', think; consider; regard.

¹² FĪE'D, animated; encouraged.

¹³ IN-NU'-MER-OUS, too many to be counted.

¹⁴ PRO-LĪF'-IC, fertilizing; causing to grow.

¹⁵ DĒ-LOS', an island that was fabled to have arisen unexpectedly out of the sea.

¹⁶ "CŌR'-AL TER'-RA-ŌES," islands built by coral insects.

¹⁷ BRĒK'-ERS, waves broken by rocks or shoals.

¹⁸ SŪBT'-LE (sūt'tl), very small; difficult of detection.

¹⁹ FLŌ'-RA, the goddess of flowers.

PART IV.
MISCELLANEOUS.
LESSON I.



BETTER THAN DIAMONDS.

1. I was standing in the broad, crowded street of a large city. It was a cold winter's day. There had been rain; and although the sun had been shining brightly, yet the long icicles hung from the eaves of the houses, and the wheels rumbled loudly as they passed over the ground. There was a clear, bright look, and a cold, bracing feeling in the air, and a keen northwest wind, which quickened every step.

2. Just then a little child came running along—a poor, ill-clad¹ child; her clothes were scant² and threadbare; she had no cloak and no shawl, and her little bare feet looked red and suffering. She could not have been more than eight years old. She carried a bundle in her hand. Poor little shivering child! I pitied her. As she passed me her foot slipped,

and she fell with a cry of pain; but she held the bundle tightly in her hand, and, jumping up, although she limped sadly, endeavored to run as before.

3. "Stop! little girl, stop!" said a sweet voice; and a beautiful woman, wrapped in a huge shawl and with furs around her, came out of a jeweler's store close by. "Poor little child," she said, "are you hurt? Sit down on this step and tell me."

How I loved her, and how beautiful she looked!

"Oh, I can not," said the little child, "I can not wait—I am in such a hurry. I have been to the shoemaker's, and mother must finish this work to-night, or she will never get any more shoes to bind."

4. "To-night?" said the beautiful woman, "to-night?"

"Yes," said the child, for the stranger's kind manner had made her bold, "yes, for the great ball to-night; and these satin slippers must be spangled; and—"

The beautiful woman took the bundle from the child's hand and unrolled it. You do not know why her face flushed, and then turned pale; but I, yes I, looked into the bundle, and on the inside of a slipper I saw a name—a lady's name written, but I shall not tell it.

"And where does your mother live, little girl?"

5. So the child told her where; and then she told her that her father was dead, and that her little brother was sick, and that her mother bound shoes that they might have bread; but that sometimes they were very cold, and that her mother sometimes cried because she had no money to buy milk for her little brother. And then I saw that the lady's eyes were full of tears; and she rolled up the bundle quickly, and gave it back to the little girl; and, turning away, went back into the store from which she had just come out. As she went away I saw the glitter of a diamond pin. Presently she came back, and, stepping into a handsome carriage, rolled off. The little girl looked after her a moment, and then, with her little bare feet colder than they were before, ran quickly away.

6. I followed the little girl to a narrow damp street, and into a small dark room; I there saw her mother—her sad,

faded mother, but with a face so sweet, so patient—hushing and soothing a sick baby. And the baby slept, and the mother laid it on her lap; and the bundle was unrolled, and a dim candle helped her with her work; for though it was not night, yet her room was very dark. Then, after a while, she kissed her little girl, and bade her warm her poor frozen feet over the scanty fire in the grate, and gave her a little piece of bread, for she had no more; and then she heard her say her evening prayer, and folded her tenderly to her bosom, blessed her, and told her that the angels would take care of her.

7. And the little child slept and dreamed—oh! such pleasant dreams—of warm stockings and new shoes; but the mother sewed alone, and as the bright spangles glittered on the satin slippers, came there no repining³ into the heart? When she thought of her child's bare, cold feet, and of the scant morsel of dry bread, that had not satisfied her hunger, came there visions of a bright room and gorgeous⁴ clothing, and a table loaded with all that was good, a little portion of which spared to her would give warmth and comfort to her humble dwelling?

8. If such thoughts came, and others, of a pleasant cottage, and of one who had dearly loved her, and whose strong arm had kept want and trouble from her and her babes, but who could never come back—if these thoughts did come repiningly, there also came another; and the widow's hands were clasped, and her head bowed low in deep contrition,⁵ as I heard her say, "Father, forgive me, for thou doest all things well, and I will trust to thee."

9. Just then the door opened softly, and some one entered. Was it an angel? Her dress was spotless white, and she moved with a noiseless step. She went to the bed where the sleeping child lay, and covered it with soft, warm blankets. Then presently a fire sparkled and blazed there, such as the little grate had never known before. Then a huge loaf was placed upon the table, and fresh milk for the sick babe.

10. Then she passed gently before the mother, and, drawing the unfinished slipper from her hand, placed there a purse of gold, and said, in a voice like music, "Bless thy God, who

is the God of the fatherless and the widow!" and she was gone, only as she went out I heard her say, "Better than diamonds—better than diamonds!" Whom could she mean? I looked at the mother. With clasped hands and streaming eyes she blessed her God, who had sent an angel to comfort her.

11. So I went too; and I went to a bright room, where were music and dancing, and sweet flowers; and I saw the young, happy faces of those who were there, and beautiful dresses sparkling with jewels; but none that I knew, until one passed me whose dress was of simple white, with only a rose-bud on her bosom, and whose voice was like the sweet sound of a silver lute.⁶ No spangled slipper was on her foot; but she moved as one that treadeth upon the air, and the divine beauty of holiness had so glorified her face, that I felt, as I gazed upon her, that she was almost an angel of God.

Anonymous.

¹ ILL-CLAD, poorly clad.

² SCANT, too small.

³ RE-PIN'-ING, complaining; murmuring.

⁴ GOR'-GEOUS, showy; splendid.

⁵ CON-TRITION, penitence; sorrow.

⁶ LUTE, an instrument of music with strings.

LESSON II.

ABRAM AND ZIMRI.

1. ABRAM and Zimri owned a field together—
 A level field hid in a happy vale.
 They plowed it with one plow, and in the spring
 (Sowed, walking side by side, the fruitful seed.)
 In harvest, when the glad earth smiled with grain,
 Each carried to his home one half the sheaves,
 And stored them with much labor in his barns.
 Now Abram had a wife and seven sons,
 But Zimri dwelt alone within his house.
2. One night, before the sheaves were gathered in,
 As Zimri lay upon his lonely bed,
 And counted in his mind his little gains,
 He thought upon his brother Abram's lot,
 And said, "I dwell alone within my house,
 But Abram hath a wife and seven sons,

And yet we share the harvest sheaves alike :
He surely needeth more for life than I ;
I will arise, and gird myself, and go
Down to the field, and add to his from mine."

3. So he arose, and girded up his loins,
And went out softly to the level field.
The moon shone out from dusky bars of clouds,
The trees stood black against the cold blue sky,
The branches waved, and whispered in the wind.)
So Zimri, guided by the shifting light,
Went down the mountain path, and found the field,
Took from his store of sheaves a generous third,
And bore them gladly to his brother's heap,
And then went back to sleep and happy dreams.
4. Now, that same night, as Abram lay in bed,
Thinking upon his blissful state in life,
He thought upon his brother Zimri's lot,
And said, "He dwells within his house alone,
He goeth forth to toil with few to help,
He goeth home at night to a cold house,
And hath few other friends but me and mine"
(For these two tilled the happy vale alone);
"While I, whom Heaven hath very greatly blessed,
Dwell happy with my wife and seven sons,
Who aid me in my toil, and make it light,
And yet we share the harvest sheaves alike.
This surely is not pleasing unto God.
I will arise, and gird myself, and go
Out to the field, and borrow from my store,
And add unto my brother Zimri's pile."
5. So he arose, and girded up his loins,
And went down softly to the level field.
The moon shone out from silver bars of clouds,
The trees stood black against the starry sky,
The dark leaves waved and whispered in the breeze.
So Abram, guided by the doubtful light,
Passed down the mountain path, and found the field,

Took from his store of sheaves a generous third,
And added them unto his brother's heap;
Then he went back to sleep and happy dreams.

6. So the next morning with the early sun
The brothers rose, and went out to their toil.
And when they came to see the heavy sheaves,
Each wondered in his heart to find his heap,
Though he had given a third, was still the same.

7. Now the next night went Zimri to the field,
Took from his store of sheaves a generous share,
And placed them on his brother Abram's heap,
And then lay down behind his pile to watch.
The moon looked out from bars of silvery cloud,
The cedars stood up black against the sky,
The olive-branches whispered in the wind.

8. Then Abram came down softly from his home,
And, looking to the left and right, went on,
Took from his ample store a generous third,
And laid it on his brother Zimri's pile.
Then Zimri rose, and caught him in his arms,
And wept upon his neck, and kissed his cheek;
And Abram saw the whole, and could not speak;
Neither could Zimri, for their hearts were full.

CLARENCE COOK

LESSON III.

SORROW FOR THE DEAD.

1. THE sorrow for the dead is the only sorrow from which we refuse to be divorced.¹ Every other wound we seek to heal, every other affliction to forget; but this wound we consider it a duty to keep open; this affliction we cherish and brood over in solitude.

2. Where is the mother who would willingly forget the infant that perished like a blossom from her arms, though every recollection is a pang? Where is the child that would

willingly forget the most tender of parents, though to remember be but to lament'? Who, even in the hour of agony, would forget the friend over whom he mourns'? Who, even when the tomb is closing upon the remains of her he most loved, when he feels his heart, as it were, crushed in the closing of its portal, would accept of consolation that must be bought by forgetfulness'?

3. No; the love which survives the tomb is one of the noblest attributes² of the soul. 'If it has its woes', it has likewise its delights'; and when the overwhelming burst of grief is calmed into the gentle tear of recollection', when the sudden anguish and the convulsive agony over the present ruins of all that we most loved, is softened away into pensive meditation, on all that it was in the days of its loveliness', who would root out such a sorrow from the heart'?

4. Though it may sometimes throw a passing cloud over the bright hour of gayety, or spread a deeper sadness over the hour of gloom', yet who would exchange it even for the song of pleasure or the burst of revelry'? No; there is a voice from the tomb sweeter than song. There is a remembrance of the dead, to which we turn even from the charms of the living.

5. O, the grāve! the grāve! It buries every error', covers every defect', extinguishes every resentment'. From its peaceful bosom spring none but fond regrets and tender recollections. Who can look down upon the grave even of an enemy, and not feel a compunctious³ throb that he should ever have warred with the poor handful of earth that lies mouldering before him'?

6. But the grave of those we loved—what a place for meditation! There it is that we call up in long review the whole history of virtue and gentleness, and the thousand endearments⁴ lavished⁵ upon us almost unheeded in the daily intercourse of intimacy; there it is that we dwell upon the tenderness, the solemn, awful tenderness of the parting scene—the bed of death, with all its stifled griefs, its noiseless attendants, its mute, watchful assiduities—the last testimonies of expiring love—the feeble, fluttering, thrilling—O how thrilling!—pressure of the hand—the last fond look of the

glazing eye, turning upon us even from the threshold of existence—the faint, faltering accents, struggling in death to give one more assurance of affection.

7. Ay, go to the grave of buried love, and meditate! There settle the account with thy conscience for every past benefit unrequited,⁶ every past endearment unregarded, of that departed being who can never—never—never return to be soothed by thy contrition!

8. If thou art a child', and hast ever added a sorrow to the soul, or a furrow to the silver brow of an affectionate parent'; if thou art a husband, and hast ever caused the fond bosom that ventured its whole happiness in thy arms to doubt one moment of thy kindness or thy truth'; if thou art a friend, and hast ever wronged, in thought, or word, or deed, the spirit that generously confided in thee'; if thou art a lover, and hast ever given one unmerited pang to that true heart which now lies cold and still beneath thy feet', then be sure that every unkind look', every ungracious word', every ungentle action', will come thronging back upon thy memory, and knocking dolefully at thy soul'; then be sure that thou wilt lie down sorrowing and repentant on the grave, and utter the unheard groan, and pour the unavailing tear, more deep, more bitter, because unheard and unavailing.

9. Then weave thy chaplet⁷ of flowers, and strew the beauties of nature about the grave; console thy broken spirit, if thou canst, with these tender yet futile⁸ tributes of regret; but take warning by the bitterness of this thy contrite⁹ affliction over the dead, and henceforth be more faithful and affectionate in the discharge of thy duties to the living.

IRVING.

¹ DI-VÖR'CED, separated.

² AT'-TRI-BUTE, quality; that which belongs to.

³ COM-PUNG'-TIOUS, causing grief or remorse.

⁴ EN-DEAR'-MENTS, acts of affection.

⁵ LAV'-ISHED, bestowed freely.

⁶ UN-RE-QUIT'-ED, not repaid; not recompensed.

⁷ CHAP'-LET, garland.

⁸ FU'-TILE, of no effect; unavailing.

⁹ CON'-TRITE, penitent; humble.

LESSON VI.

SPECTACLES, OR HELPS TO READ.

1. A CERTAIN artist—I've forgot his name—
 Had got, for making spectacles, a fame,
 Or "helps to read," as, when they first were sold,
 Was writ upon his glaring sign in gold;
 And, for all uses to be had from glass,
 His were allowed by readers to surpass.
2. There came a man into his shop one day—
 "Are you the spectacle contriver, pray'?"
 "Yes, sir'," said he; "I can in that affair
 Contrive to please you, if you want a pair'."
 "Can you? pray do, then'." So, at first, he chose
 To place a *youngish* pair upon his nose;
 And book produced, to see how they would fit:
 Asked how he *liked* 'em'? "Like 'em'? not a bit'."
3. "Then, sir, I fancy, if you please to try,
 These in my *hand* will better suit your eye'."
 "No', but they don't'." "Well, come, sir, if you please,
 Here is *another* sort', we'll e'en try these';
 Still somewhat more they magnify the letter';
 Now, sir'?" "Why, now—I'm not a bit the better'."
 "No'? here, take these, that magnify still more;
 How do *they* fit'?" "Like all the rest before."
4. In short, they tried a whole assortment through,
 But all in vain, for none of 'em would do.
 The operator, much surprised to find
 So odd a case, thought, sure the man is blind!
 "What sort of eyes can you have got'?" said he.
 "Why, very good ones, friend, as you may see."
 "Yes, I perceive the clearness of the *ball*—
 Pray, let me ask you, can you read *at all* '?"
 "No', you great blockhead; if I could, what need
 Of paying *you* for any '*helps to read*'?"
 And so he left the maker in a heat,
 Resolved to post him for an arrant cheat.

BYROM.

LESSON VII.



THE MAY QUEEN.

1. You must wake and call me early, call me early, mother dear ;
To-morrow 'll be the happiest time of all the glad New-year ;
Of all the glad New-year, mother, the maddest, merriest day ;
For I'm to be Queen o' the May, mother, I'm to be Queen o' the May.
2. There's many a black black eye, they say, but none so bright as mine ;
There's Margaret and Mary, there's Kate and Caroline :
But none so fair as little Alice in all the land they say,
So I'm to be Queen o' the May, mother, I'm to be Queen o' the May.
3. I sleep so sound all night, mother, that I shall never wake,
If you do not call me loud when the day begins to break :
But I must gather knots of flowers, and buds and garlands gay,
For I'm to be Queen o' the May, mother, I'm to be Queen o' the May.
4. As I came up the valley, whom think ye should I see,
But Robin leaning on the bridge beneath the hazel-tree ?
He thought of that sharp look, mother, I gave him yesterday—
But I'm to be Queen o' the May, mother, I'm to be Queen o' the May.



5. They say he's dying all for love, but that can never be:
They say his heart is breaking, mother—what is that to me?
There's many a bolder lad will woo me any summer day,
For I'm to be Queen o' the May, mother, I'm to be Queen o' the May.
6. Little Effie shall go with me to-morrow to the green,
And you'll be there too, mother, to see me made the Queen;
For the shepherd-lads on every side will come from far away—
And I'm to be Queen o' the May, mother, I'm to be Queen o' the May.

NEW-YEAR'S EVE.

7. If you're waking, call me early, call me early, mother dear,
For I would see the sun rise upon the glad New-year:
It is the last New-year that I shall ever see,
Then you may lay me low in the mould, and think no more of me.
8. To-night I saw the sun set: he set and left behind
The good old year, the dear old time, and all my peace of mind;
And the New-year's coming up, mother, but I shall never see,
The blossom on the blackthorn, the leaf upon the tree.
9. Last May we made a crown of flowers; we had a merry day:
Beneath the hawthorn on the Green they made me Queen of May;
And we danced about the May-pole and in the hazel copse,¹
Till Charles's Wain² came out above the tall white chimney-tops
10. There's not a flower on all the hills: the frost is on the pane;
I only wish to live till the snowdrops come again:
I wish the snow would melt, and the sun come out on high:
I long to see a flower so, before the day I die.

11. The building rook will caw³ from the windy tall elm-tree,
And the tufted plover pipe along the fallow⁴ lea,⁵
And the swallow will come back again with summer o'er the wave—
But I shall lie alone, mother, within the mouldering grave.
12. When the flowers come again, mother, beneath the waning light
You'll never see me more in the long gray fields at night;
When from the dry dark wold⁶ the summer airs blow cool
On the oat-grass and the sword-grass, and the bulrush in the pool.
13. You'll bury me, my mother, just beneath the hawthorn shade,
And you'll come sometimes and see me where I am lowly laid.
I shall not forget you, mother; I shall hear you when you pass,
With your feet above my head in the long and pleasant grass.
14. I have been wild and wayward, but you'll forgive me now:
You'll kiss me, my own mother, upon my cheek and brow;
Nay, nay, you must not weep, nor let your grief be wild,
You should not fret for me, mother—you have another child.
15. Good-night, good-night, when I have said good-night for evermore,
And you see me carried out from the threshold of the door,
Don't let Effie come to see me till my grave be growing green:
She'll be a better child to you than ever I have been.
16. She'll find my garden-tools upon the granary floor:
Let her take them: they are hers: I shall never garden more:
But tell her, when I'm gone, to train the rose-bush that I set
About the parlor window, and the box of mignonnette.⁷
17. Good-night, sweet mother: call me before the day is born.
All night I lie awake, but I fall asleep at morn;
But I would see the sun rise upon the glad New-year,
So, if you're waking, call me, call me early, mother dear.

CONCLUSION.

18. I thought to pass away before, and yet alive I am;
And in the fields all round I hear the bleating of the lamb.
How sadly, I remember, rose the morning of the year!
To die before the snowdrop came, and now the violet's here.
19. It seemed so hard at first, mother, to leave the blessed sun,
And now it seems as hard to stay, and yet His will be done!
But still I think it can't be long before I find release;
And that good man, the clergyman, has told me words of peace.
20. O blessings on his kindly voice, and on his silver hair!
And blessings on his whole life long, until he meet me there!
O blessings on his kindly heart, and on his silver head!
A thousand times I bless'd him as he knelt beside my bed.



21. He show'd me all the mercy, for he taught me all the sin:
Now, though my lamp was lighted late, there's One will let me in:
Nor would I now be well, mother, again, if that could be,
For my desire is but to pass to Him that died for me.
22. O look! the sun begins to rise, the heavens are in a glow;
He shines upon a hundred fields, and all of them I know.
And there I move no longer now, and there his light may shine—
Wild flowers in the valley for other hands than mine.
23. O sweet and strange it seems to me, that, ere this day is done,
The voice that now is speaking may be beyond the sun—
Forever and forever with those just souls and true—
And what is life, that we should moan? why make we such ado?
24. Forever and forever, all in a blessed home—
And there to wait a little while till you and Effie come;
To lie within the light of God, as I lie upon your breast—
And the wicked cease from troubling, and the weary are at rest.

TENNYSON.

¹ *COARSE*, a wood of small growth.

² *CHARLES'S WAIN*, a constellation or group of fixed stars.

³ *CAW*, to cry like a crow, rook, or raven.

⁴ *FAL'-LŌW*, left unsowed or untilld after plowing.

⁵ *LĒA*, meadow or sward land.

⁶ *WŌLD*, a wood; sometimes a plain.

⁷ *MIGN-ON-NETTE'* (*min-yon-et'*), a plant.

LESSON VIII.

THE BISHOP AND THE KING.

1. A HEATHEN king once caused a pious bishop to be brought before him, and required of him that he should deny his faith and sacrifice to the gods. But the bishop said, "My lord and king, that I shall not do." Then was the king exceeding angry, and said, "Knowest thou not that thy life is in my power, and I can kill thee? One look, and it will be done."

2. "I know that," answered the bishop; "but allow me first to state a case to thee, and a question for thy decision. Suppose that one of thy most faithful servants should fall into the power of thine enemies, and that they should seek to move him to be unfaithful toward thee, so that he should betray thee. But, seeing that thy servant remained steadfast in his fidelity, the enemies should take him, and, stripping him of all his clothes, send him away naked, in the midst of mockings and insults. Say, O king, when he should return to thee thus, wouldst thou not give him thy best robes, and recompense him for his disgrace with honor?"

3. And the king answered and said, "Well, yes; but what does all this mean, and where has such a thing happened?" Then spake the holy bishop, "Behold, thou canst strip me of this earthly garment; but I have a Master who will robe me anew. Ought I then to regard the dress, and give up *fidelity* for it?" Then said the heathen monarch, "Go! I give thee thy life!"

LESSON IX.

CONSIDER BOTH SIDES OF A QUESTION.

1. IN the days of knight-errantry¹ and paganism, one of our old British princes set up a statue to the goddess of Victory, in a point where four roads met together. In her right hand she held a spear, and her left hand rested upon a shield.

The outside of this shield was of gold, and the inside of silver. On the former was inscribed,² in the old British language, "To the goddess ever favorable;" and on the other, "For four victories obtained successively over the Picts and other inhabitants of the northern islands."

2. It happened one day that two knights completely armed, one in black armor, the other in white, arrived from opposite parts of the country at this statue, just about the same time; and, as neither of them had seen it before, they stopped to read the inscription, and observe the excellence of its workmanship.

3. After contemplating it for some time, "This golden shield," says the black knight—"Golden shield!" cried the white knight (who was as strictly observing the opposite side), "why, if I have my eyes, it is silver." "I know nothing of your eyes," replied the black knight; "but if ever I saw a golden shield in my life, this is one." "Yes," returned the white knight, smiling, "it is very probable, indeed, that they should expose a shield of gold in so public a place as this! For my part, I wonder even a silver one is not too strong a temptation for the devotion of some people who pass this way; and it appears, by the date, that this has been here above three years."

4. The black knight could not bear the smile with which this was delivered, and grew so warm in the dispute that it soon ended in a challenge; they both, therefore, turned their horses, and rode back so far as to have sufficient space for their career; then, fixing their spears in their rests, they flew at each other with the greatest fury and impetuosity.³ Their shock was so rude, and the blow on each side so effectual, that they both fell to the ground, much wounded and bruised, and lay there for some time, as in a trance.

5. A good Druid, who was traveling that way, found them in this condition. The Druids were the physicians of those times as well as the priests. He had a sovereign balsam about him, which he had composed himself, for he was very skillful in all the plants that grew in the fields or in the forests; he stanch'd their blood, applied his balsam to their wounds, and brought them, as it were, from death to life

again. As soon as they were sufficiently recovered, he began to inquire into the occasion of their quarrel. "Why, this man," cried the black knight, "will have it that yonder shield is silver." "And he will have it," replied the white knight, "that it is gold." And then they told him all the particulars of the affair.

6. "Ah!" said the Druid, with a sigh, "you are both of you, my brethren, in the right, and both of you in the wrong. Had either of you given himself time to look at the opposite side of the shield, as well as that which first presented itself to view, all this passion and bloodshed might have been avoided. However, there is a very good lesson to be learned from the evils that have befallen you on this occasion. Permit me, therefore, to entreat you by all our gods, and by this goddess of Victory in particular, *never to enter into any dispute for the future till you have fairly considered both sides of the question.*"

BEAUMONT.

¹ KNIGHT-EE'-RANT-RY, the practice of wandering about in quest of adventures. ² IN-SCRIB'ED, written or printed. ³ IM-PET-Ū-OS'-I-TY, violence.

LESSON X.

THE CHAMELEON.

1. THE chameleon is an animal of the lizard kind, chiefly found in Arabia and Egypt, whose color often changes without any apparent¹ cause; which circumstance has given rise to the following fable, showing, in a lively and striking manner, the folly of positiveness in opinion:

2. Two travelers of conceited² cast,
As o'er Arabia's wilds they passed,
And, on their way, in friendly chat,
Now talked of this, and then of that,
Discoursed a while, 'mongst *other* matter,
Of the *chameleon's* form and nature.

3. "A stranger animal," cries one,
"Sure never lived beneath the sun;
A lizard's body, lean and long';
A fish's head'; a serpent's tongue';

Its foot with triple³ claw disjoined⁴;
And what a length of tail behind¹!
How slow its pace¹! and then its hue—
Who ever saw so fine a blue²?”

4. “Hold there,” the other quick replies;
“’Tis *green*—I saw it with these eyes,
As late with open mouth it lay,
And warmed it in the sunny ray;
Stretched at its ease, the beast I viewed,
And saw it eat the air for food.”
5. “*I’ve* seen it, sir, as well as *you’*,
And must again affirm it *blue*;
At leisure I the beast surveyed
Extended in the cooling shade.”
6. “’Tis *green*, ’tis *green*, sir, I assure ye.”
“Green¹!” cries the other, in a fury:
“Why, sir, d’ye think I’ve lost my eyes²?”
“’Twere no great loss³,” the friend replies⁴;
“For if they always serve you thus⁵,
You’ll find them but of little use.”
7. So high at last the contest rose,
From words they almost came to blows;
When luckily came by a third—
To him the question they referred;
And begged he’d tell them, if he knew,
Whether the thing was green¹, or blue²?
8. “Sirs¹,” cries the umpire,⁵ “cease your pother²,
The creature’s neither one nor t’other³;
I caught the animal last night,
And viewed it o’er by candle-light;
I marked it well—’twas black as jet;
You stare! but, sirs, I’ve got it yet,
And can produce it.” “Pray, sir, do;
I’ll lay my life the thing is blue.”
9. “And *I’ll* engage that, when you’ve seen
The reptile, you’ll pronounce him green.”

"Well, then, at once to ease the doubt,"
 Replies the man, "I'll turn him out;
 And, when before your eyes I've set him',
 If you don't find him black, I'll eat him'."
 He said, then full before their sight
 Produced the beast, and lo—'twas white!

10. Both stared; the man looked wondrous wise!
 "My children'," the chameleon cries
 (Then first the creature found a tongue),
 "You all are right', and all are wrong':
 When next you talk of what you view',
 Think *others* see as well as *you*;
 Nor wonder if you find that none
 Prefers *your* eyesight to his own."

MERRICK.

¹ AP-PÂR'-ENT, plain; evident.

² CON-OËT'-ED, having too high an opinion
 of one's self.

³ TRIP'-LE, three-fold; three parted.

⁴ DIS-JOIN'-ED, separated.

⁵ UM'-PIRE, a person called in to decide a
 controversy; a judge.

⁶ POTH'-ER, foolish controversy.

LESSON XI.

WE ARE SEVEN.

1. I MET a little cottage girl,
 She was eight years old, she said;
 Her hair was thick with many a curl
 That clustered round her head.
2. She had a rustic, woodland air,
 And she was wildly clad;
 Her face was fair, yea, very fair—
 Her beauty made me glad.
3. "Sisters and brothers, little maid,
 How many may you be'?"
 "How many'? seven in all," she said,
 And wondering looked at me.
4. "And where are they, I pray you tell'?"
 She answered, "Seven are we;
 And two of us at Conway dwell,
 And two are gone to sea;

5. "Two of us in the church-yard lie,
My sister and my brother:
And in the church-yard cottage I
Dwell near them with my mother."
6. "You say that two at Conway dwell,
And two are gone to sea,
Yet ye are seven; I pray you tell,
Sweet maid, how this may be'?"
7. Then did the little maid reply,
"Seven boys and girls are we:
Two of us in the church-yard lie,
Beneath the church-yard tree."
8. "You run about, my little maid,
Your limbs they are alive;
If two are in the church-yard laid,
Then ye are only five."
9. "Their graves are green, they may be seen,"
The little maid replied,
"Twelve steps or more from my mother's door,
And they are side by side."
10. "My stockings there I often knit,
My 'kerchief there I hem;
And there upon the ground I sit—
I sit and sing to them."
11. "And often after sunset, sir,
When it is light and fair,
I take my little porringer
And eat my supper there."
12. "The first that died was little Jane:
In bed she moaning lay,
Till God relieved her of her pain,
And then she went away."
13. "So in the church-yard she was laid;
And, when the grass was dry,
Together round her grave we played,
My brother John and I."

14. "And, when the ground was white with snow,
And I could run and slide,
My brother John was forced to go,
And he lies by her side."
15. "How many are you, then," said I,
"If they two are in heaven'?"
The little maiden did reply,
"O master'! we are seven'."
16. "But they are dead—those two are dead;
Their spirits are in heaven:"
'Twas throwing words away; for still
The little maid would have her will,
And said, "Nay, we are seven." WORDSWORTH.
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LESSON XII.

ON GOOD BREEDING.

1. As learning, honor, and virtue are absolutely necessary to gain you the esteem and admiration of mankind, politeness and good breeding are equally necessary to make you agreeable in conversation and common life. Great talents are above the generality of the world, who neither possess them themselves, nor judge of them rightly in others; but all people are judges of the smaller talents, such as civility, affability, and an obliging, agreeable address and manner, because they feel the effects of them, as making society easy and pleasing.

2. Good sense must, in many cases, determine good breeding; but there are some general rules of it that always hold true. For example, it is extremely rude not to give proper attention, and a civil answer, when people speak to you; or to go away, or be doing something else, while they are speaking to you; for that convinces them that you despise them, and do not think it worth your while to hear or answer what they say. It is also very rude to take the best place in a room, or to seize immediately upon what you like at table, without offering first to help others, as if you con-

sidered nobody but yourself. On the contrary, you should always endeavor to procure all the conveniences you can to the people you are with.

3. Besides being civil, which is absolutely necessary, the perfection of good breeding is to be civil with ease, and in a becoming manner; awkwardness can proceed but from two causes, either from not having kept good company, or from not having attended to it. Attention is absolutely necessary for improving in behavior, as, indeed, it is for every thing else. If an awkward person drinks tea or coffee, he often scalds his mouth, and lets either the cup or the saucer fall, and spills the tea or coffee on his clothes.

4. At dinner his awkwardness distinguishes itself particularly, as he has more to do. There he holds his knife, fork, and spoon differently from other people; eats with his knife, to the great danger of his lips; picks his teeth with his fork; and puts his spoon, which has been in his mouth twenty times, into the dishes again. If he is to carve, he can never hit the joint; but, in his vain efforts to cut through the bone, scatters the sauce in every body's face. He generally daubs himself with soup and grease, though his napkin is commonly stuck through a button-hole, and tickles his chin. When he drinks, he coughs in his glass, and besprinkles the company.

5. Besides all this, he has strange tricks and gestures, such as snuffing up his nose, making faces, putting his fingers in his nose, or blowing it, so as greatly to disgust the company. His hands are troublesome to him when he has not something in them; and he does not know where to put them, but keeps them in perpetual motion. All this, I own, is not in any degree criminal; but it is highly disagreeable and ridiculous in company, and ought most carefully to be guarded against by every one that desires to please.

6. There is, likewise, an awkwardness of expression and words which ought to be avoided, such as false English, bad pronunciation, old sayings, and vulgar proverbs, which are so many proofs of a poor education. For example, if, instead of saying that tastes are different, and that every man has his own peculiar one, you should repeat a vulgar proverb, and

say that "what is one man's meat is another man's poison," or else, "Every one to his liking, as the good man said when he kissed his cow," the company would be persuaded that you had never associated with any but low persons.

7. To mistake or forget names, to speak of "What-d'ye-call-him," or "Thingum," or "How-d'ye-call her," is excessively awkward and vulgar. To begin a story or narration when you are not perfect in it, and can not go through with it, but are forced, possibly, to say in the middle of it, "I have forgotten the rest," is very unpleasant and bungling. One must be extremely exact, clear, and perspicuous in every thing one says; otherwise, instead of entertaining or informing others, one only tires and puzzles them.

8. The voice and manner of speaking, too, are *not* to be neglected. Some people almost shut their mouths when they speak, and mutter so that they are not to be understood; others speak so fast, and sputter, that they are equally unintelligible. Some always speak as loud as if they were talking to deaf people; and others so low that one can not hear them. All these, and many other habits, are awkward and disagreeable, and are to be avoided by attention. You can not imagine how necessary it is to mind all these little things. I have seen many people with great talents ill received for want of having these little talents of good breeding; and others well received only from their little talents, and who had no great ones.

Anonymous.

LESSON XIII.

THE HERITAGE.

1. THE rich man's son inherits¹ lands,
And piles of brick, and stone, and gold;
And he inherits soft, white hands,
And tender flesh that fears the cold,
Nor dares to wear a garment old;
A heritage,² it seems to me,
One scarce would wish to hold in fee.³

2. The rich man's son inherits cares :
The bank may break, the factory burn,
A breath may burst his bubble shares,
And soft white hands could hardly earn
A living that would serve his turn ;
A heritage, it seems to me,
One would not wish to hold in fee.
3. What doth the poor man's son inherit' ?
Stout muscles, and a sinewy heart,
A hardy frame, a hardier spirit ;
King of two hands, he does his part
In every useful toil and art ;
A heritage, it seems to me,
A king might wish to hold in fee.
4. What doth the poor man's son inherit' ?*
Wishes o'erjoyed with humble things,
A rank adjudged⁴ by toil-won merit,
Content that from employment springs,
A heart that in his labor sings ;
A heritage, it seems to me,
A king might wish to hold in fee.
5. What doth the poor man's son inherit' ?
A patience learned by being poor ;
Courage, if sorrow come, to bear it ;
A fellow-feeling that is sure
To make the outcast⁵ bless his door ;
A heritage, it seems to me,
A king might wish to hold in fee.
6. O rich man's son ! there is a toil,
That with all other level stands ;
Large charity doth never soil,
But only whiten soft white hands—
This is the best crop from thy lands ;

* This may be regarded in the nature of an indirect question, asking a *repetition* of what may not have been fully understood. See Note to Rule III. Or it may be regarded as an exclamatory sentence that becomes a question. See Note to Rule X. In either case it should receive the rising inflection.

A heritage, it seems to me,
Worth being rich to hold in fee.

7. O poor man's son! scorn not thy state;
There is worse weariness than thine,
In merely being rich and great:
Toil only gives the soul to shine,
And makes rest fragrant and benign;⁶
A heritage, it seems to me,
Worth being poor to hold in fee.

8. Both, heirs to some six feet of sod,
Are equal in the earth at last;
Both, children of the same dear God,
Prove title to your heirship vast
By record of a well-filled past;
A heritage, it seems to me,
Well worth a life to hold in fee.

J. R. LOWELL.

¹ IN-HER'-ITS, takes by descent from an ancestor.

² HER'-IT-AGE, an inheritance; estate derived from an ancestor.

³ "IN FEE," an estate or property which one has in his own right, and which may be inherited by his heirs.

⁴ AD-JUDG'ED, decreed; determined.

⁵ OUT'-CAST, one driven from home or country.

⁶ BE-NIGN', favorable; having a good influence.

LESSON XIV.

SCHEMES OF LIFE OFTEN ILLUSORY.

1. OMAR, the son of Hassan', had passed seventy-five years in honor and prosperity'. The favor of three successive califs had filled his house with gold and silver; and whenever he appeared', the benedictions of the people proclaimed his presence.

2. Earthly happiness is of short continuance'. The brightness of the flame is wasting its fuel'; the fragrant flower is passing away in its own odors'. The vigor of Omar began to fail'; the curls of beauty fell from his head'; strength departed from his hands', and agility from his feet'. He gave back to the calif the keys of trust, and the seals of secrecy; and sought no other pleasure for the remainder of life than the converse of the wise', and the gratitude of the good'.

3. The powers of his mind were yet unimpaired. His chamber was filled by visitants, eager to catch the dictates of experience, and officious to pay the tribute of admiration. Caleb, the son of the viceroy of Egypt', entered every day early, and retired late'. He was beautiful and eloquent': Omar admired his wit, and loved his docility.

4. "Tell me," said Caleb', "thou to whose voice nations have listened, and whose wisdom is known to the extremities of Asia', tell me how I may resemble Omar the prudent'. The arts by which thou hast gained power and preserved it, are to thee no longer necessary nor useful; impart to me' the secret of thy conduct, and teach me the plan upon which thy wisdom has built thy fortune'."

5. "Young man'," said Omar', "it is of little use to form plans of life'. When I took my first survey of the world in my twentieth year', having considered the various conditions of mankind, in the hour of solitude I said thus to myself, leaning against a cedar, which spread its branches over my head: 'Seventy years are allowed to man'; I have yet fifty remaining.

6. "'Ten years I will allot to the attainment of knowledge', and ten I will pass in foreign countries'; I shall be learned', and therefore shall be honored'; every city will shout at my arrival', and every student will solicit my friendship'. Twenty years thus passed will store my mind with images, which I shall be busy, through the rest of my life, in combining and comparing. I shall revel in inexhaustible accumulations of intellectual riches'; I shall find new pleasures for every moment', and shall never more be weary of myself'.

7. "'I will not, however, deviate too far from the beaten track of life', but will try what can be found in female delicacy'. I will marry a wife as beautiful as the Houris', and wise as Zobeide'; and with her I will live twenty years within the suburbs of Bagdat, in every pleasure that wealth can purchase, and fancy can invent.

8. "'I will then retire to a rural dwelling, pass my days in obscurity and contemplation, and lie silently down on the bed of death. Through my life it shall be my settled resolution that I will never depend on the smile of princes; that I

will never stand exposed to the artifices of courts; that I will never pant for public honors, nor disturb my quiet with the affairs of state.' Such was my scheme of life, which I impressed indelibly upon my memory.

9. "The first part of my ensuing time was to be spent in search of knowledge', and I know not how I was diverted from my design'. I had no visible impediments without', nor any ungovernable passions within'. I regarded knowledge as the highest honor, and the most engaging pleasure'; yet day stole upon day, and month glided after month, till I found that seven years of the first ten had vanished', and left nothing behind' them.

10. "I now postponed my purpose of traveling; for why should I go abroad', while so much remained to be learned at home'? I immured myself for four years, and studied the laws of the empire. The fame of my skill reached the judges: I was found able to speak upon doubtful questions, and I was commanded to stand at the footstool of the calif. I was heard with attention; I was consulted with confidence, and the love of praise fastened on my heart.

11. "I still wished to see distant countries; listened with rapture to the relations of travelers, and resolved some time to ask my dismissal, that I might feast my soul with novelty'; but my presence was always necessary, and the stream of business hurried me along. Sometimes I was afraid lest I should be charged with ingratitude; but I still proposed to travel, and therefore would not confine myself by marriage.

12. "In my fiftieth year', I began to suspect that the time of my traveling was past, and thought it best to lay hold on the felicity yet in my power, and indulge myself in domestic pleasures. But at fifty no man easily finds a woman beautiful as the Houris, and wise as Zobeide. I inquired, and rejected, consulted and deliberated, till the sixty-second year made me ashamed of wishing to marry. I had now nothing left but retirement'; and for retirement I never found a time', until disease forced me from public employment'.

13. "Such was my scheme', and such has been its consequence'. With an insatiable thirst for knowledge', I trifled away the years of improvement'; with a restless desire of

seeing different countries', I have always resided in the same city'; with the highest expectation of connubial felicity', I have lived unmarried'; and with an unalterable resolution of contemplative retirement', I am going to die within the walls of Bagdat'."

LESSON XV.

A PSALM OF LIFE.

1. TELL me not, in mournful numbers,
Life is but an empty dream'!
For the soul is *dead*' that slumbers',
And things are not what they seem'.
2. Life is *real*' ! Life is *earnest*' !
And the grave is *not* its goal;
"Dust thou art, to dust returnest,"
Was not spoken of the *soul*.
3. Not enjoyment, and not sorrow,
Is our destined end or way;
But to act, that each to-morrow
Find us farther than to-day.
4. Art is long, and time is fleeting;
And our hearts, though stout and brave
Still, like muffled drums, are beating
Funeral marches to the grave.
5. In the world's broad field of battle,
In the bivouac of life,
Be not like dumb, driven cattle!
Be a hero in the strife.
6. Trust no future, howe'er pleasant,
Let the dead Past bury its dead !
Act—act in the living present !
Heart within, and God o'erhead.
7. Lives of great men all remind us,
We can make *our* lives sublime;
And, departing, leave behind us
Footprints on the sands of time;

8. Footprints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing, shall take heart again.

9. Let us, then, be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labor and to wait.

LONGFELLOW.

LESSON XVI.

PRACTICAL PRECEPTS.

SIR MATTHEW HALE.

1. NEVER speak any thing for a truth which you know or believe to be false. Lying is a great sin against God, who gave us a tongue to speak truths, and not falsehoods. It is a great offense against humanity itself; for where there is no regard to truth, there can be no safe society between man and man.

2. And it is an injury to the speaker; for, besides the disgrace which it brings upon him, it occasions so much baseness of mind that he can scarcely tell truth, or avoid lying even when he has no color of necessity for it; and, in time, he comes to such a pass that, as other people can not believe he speaks truth, so he himself scarcely knows when he tells a falsehood.

3. You must not equivocate, nor speak any thing positively for which you have no authority but report, or conjecture, or opinion. Let your words be few, especially when your superiors or strangers are present, lest you betray your own weakness, and rob yourself of the opportunity which you might otherwise have had to gain knowledge, wisdom, and experience, by hearing those whom you silence by your impertinent talking.

4. Be not too earnest, loud, or violent in your conversation. Silence your opponent with reason, not with noise. Be careful not to interrupt another when he is speaking. Hear h'

out, and you will understand him the better, and be able to give him the better answer.

5. Consider before you speak, especially when the business is of moment; weigh the sense of what you mean to utter, and the expressions you intend to use, that they may be significant, to the point, and inoffensive. Inconsiderate persons do not think till they speak; or they speak, and then think.

6. Some men excel in one thing, some in another. In conversation learn, as near as you can, where the skill or excellence of any person lies; put him upon talking on that subject, observe what he says, keep it in your memory, or commit it to writing. By this means you will glean knowledge from every one with whom you converse, and at an easy rate acquire what may be of use to you on many occasions.

7. When you are in company with light, vain, impertinent persons, let the observing of their failings make you the more cautious both in your conversation with them and in your general behavior, that you may avoid their errors.

8. If any one, whom you do not know to be a person of truth, sobriety, and weight, relates strange stories, be not too ready to believe or report them; and yet, unless he is one of your familiar acquaintances, be not too forward to contradict him.

9. If the occasion requires you to declare your opinion, do it modestly and gently, not bluntly nor coarsely; by this means you will avoid giving offense, or being abused for too much credulity.

LESSON XVII.

THE INQUIRY.

CHARLES MACKAY.

1. TELL me, ye winged winds,
That round my pathway roar,
Do ye not know some spot
Where mortals weep no more?

Some lone and pleasant dell,)
 Some valley in the west,
 Where, free from toil and pain,
 The weary soul may rest?
 The loud wind dwindled to a whisper low,
 And sighed for pity, as it answered—"No."

2. Tell me, thou mighty deep,
 Whose billows round me play,
 Know'st thou some favored spot,
 Some island far away,
 Where weary man may find
 The bliss for which he sighs—
 Where sorrow never lives,
 And friendship never dies?
 The loud waves, rolling in perpetual flow,
 Stopped for a while, and sighed to answer—"No."

3. And thou, serenest moon,
 That, with such lovely face,
 Dost look upon the earth
 Asleep in night's embrace,
 Tell me, in all thy round,
 Hast thou not seen some spot
 Where miserable man
 Might find a happier lot?
 Behind a cloud the moon withdrew in woe,
 And a voice, sweet but sad, responded—"No."

4. Tell me, my secret soul,
 Oh! tell me, Hope and Faith,
 Is there no resting-place
 From sorrow, sin, and death?
 Is there no happy spot
 Where mortals may be blessed,
 Where grief may find a balm,
 And weariness a rest?
 Faith, Hope, and Love, best boons to mortals given,
 Waved their bright wings, and whispered—"YES, IN
 HEAVEN!"

LESSON XVIII.

THE HOUR OF PRAYER.

1. CHILD', amid the flowers at play,
While the red light fades away';
Mother', with thine earnest eye
Ever following silently';
Father', by the breeze at eve
Call'd thy harvest work to leave'—
Pray': ere yet the dark hours be,
Lift the heart and bend the knee'.
2. Traveler', in the stranger's land,
Far from thine own household band';
Mourner', haunted by the tone
Of a voice from this world gone';
Captive', in whose narrow cell
Sunshine hath not leave to dwell';
Sailor', on the darkening sea',—
Lift the heart and bend the knee.
3. Warrior', that from battle won,
Breathest now at set of sun';
Woman', o'er the lowly slain
Weeping on his burial plain';
Ye that triumph', ye that sign',
Kindred by one holy tie',
Heaven's first star alike ye see';—
Lift the heart and bend the knee'.

HEMANS. X

Prayer is the soul's sincere desire,
Uttered or unexpressed—
The motion of a hidden fire
That trembles in the breast.
Prayer is the simplest form of speech
That infant lips can try—
Prayer the sublimest strains that reach
The Majesty on high.

MONTGOMERY.

LESSON XIX.



THE THREE SONS.

1. I HAVE a son, a little son, a boy just five years old,
With eyes of thoughtful earnestness, and mind of gentle mould;
They tell me that unusual grace in all his ways appears,
That my child is grave and wise of heart beyond his childish years.
I can not say how this may be—I know his face is fair,
And yet his chiefest comeliness is his sweet and serious air:
I know his heart is kind and fond, I know he loveth me,
But loveth yet his mother more with grateful fervency.
2. But that which others most admire is the thought which fills his mind,
The food for grave inquiring speech he every where doth find:

- Strange questions doth he ask of me, when we together walk ;
He scarcely thinks as children think, or talks as children talk ;
Nor cares he much for childish sports, dotes not on bat or ball,
But looks on manhood's ways and works, and aptly mimics all.
3. His little heart is busy still, and oftentimes perplex'd
With thoughts about this world of ours, and thoughts about the next ;
He kneels at his dear mother's knee, she teaches him to pray,
And strange, and sweet, and solemn then are the words which he will say.
Oh, should my gentle child be spared to manhood's years like me,
A holier and a wiser man I trust that he will be :
And when I look into his eyes, and stroke his thoughtful brow,
I dare not think what I should feel, were I to lose him now.
4. I have a son, a second son, a simple child of three ;
I'll not declare how bright and fair his little features be,
How silver sweet those tones of his when he prattles on my knee.
I do not think his light blue eye is, like his brother's, keen,
Nor his brow so full of childish thought as his hath ever been ;
But his little heart's a fountain pure of kind and tender feeling,
And his every look's a gleam of light, rich depths of love revealing.
5. When he walks with me, the country folk, who pass us in the street,
Will shout with joy, and bless my boy, he looks so mild and sweet.
A playfellow is he to all, and yet, with cheerful tone,
Will sing his little song of love, when left to sport alone.
His presence is like sunshine sent to gladden home and hearth,
To comfort us in all our griefs, and sweeten all our mirth.
Should *he* grow up to riper years, God grant his heart may prove
As sweet a home for heavenly grace as now for earthly love.
And if, beside his grave, the tears our aching eyes must dim,
God comfort us for all the love which we shall lose in him.
6. I have a son, a third sweet son ; his age I can not tell,
For they reckon not by years or months where he is gone to dwell.
To us, for fourteen anxious months, his infant smiles were given,
And then he bade farewell to Earth, and went to live in Heaven.
I can not tell what form is his, what looks he weareth now,
Nor guess how bright a glory crowns his shining seraph brow.
The thoughts that fill his sinless soul, the bliss which he doth feel,
Are number'd with the secret things which God will not reveal.
7. But I know (for God hath told me this) that he is now at rest,
Where other blessed infants be, on their Savior's loving breast.
I know his spirit feels no more this weary load of flesh,
But his sleep is bless'd with endless dreams of joy forever fresh.
I know the angels fold him close beneath their glittering wings,
And soothe him with a song that breathes of Heaven's divinest things.
I know that we shall meet our babe (his mother dear and I),
When God for aye shall wipe away all tears from every eye.

8. What'er befalls his brethren twain, *his* bliss can never cease;
Their lot may here be grief and fear, but *his* is certain peace.
It may be that the tempter's wiles their souls from bliss may sever,
But if our own poor faith fail not, *he* must be ours forever.
When we think of what our darling is, and what we still must be—
When we muse on *that* world's perfect bliss, and *this* world's misery—
When we groan beneath this load of sin, and feel this grief and pain—
Oh! we'd rather lose our other two, than have him here again.

MOULTRIE.

LESSON XX.

THE BLIND PREACHER.

FROM WIRT'S BRITISH SPY.

1. It was one Sunday, as I was traveling through the county of Orange, that my eye was caught by a cluster of horses tied near a ruinous old wooden house, in the forest, not far from the road-side. Having frequently seen such objects before in traveling through these states, I had no difficulty in understanding that this was a place of religious worship.

2. Devotion alone, should have stopped me to join in the duties of the congregation; but I must confess that curiosity to hear the preacher of such a wilderness was not the least of my motives. On entering, I was struck with his preternatural¹ appearance. He was a tall and very spare old man; his head, which was covered with a white linen cap, his shriveled² hands, and his voice, were all shaking under the influence of a palsy;³ and a few moments ascertained⁴ to me that he was perfectly blind.

3. The first emotions which touched my breast were those of mingled pity and veneration. But how soon were all my feelings changed! It was a day of the administration of the sacrament;⁵ and his subject, of course, was the passion⁶ of our Savior. I had heard the subject handled a thousand times. I had thought it exhausted long ago.

4. Little did I suppose that in the wild woods of America I was to meet with a man whose eloquence would give to this topic a new and more sublime pathos⁷ than I had ever before witnessed. As he descended from the pulpit to distribute the mystic symbols,⁸ there was a peculiar—a more

than human solemnity in his air and manner, which made my blood run cold, and my whole frame shiver.

5. He then drew a picture of the sufferings of our Savior—his trial before Pilate—his ascent up Calvary—his crucifixion—and his death. I knew the whole history; but never, until then, had I heard the circumstances so selected, so arranged, so colored! It was all new; and I seemed to have heard it for the first time in my life.

6. His enunciation⁹ was so deliberate that his voice trembled on every syllable; and every heart in the assembly trembled in unison.¹⁰ His peculiar phrases had that force of description, that the original scene appeared to be, at that moment, acting before our eyes. We saw the very faces of the Jews; the staring, frightful distortions of malice and rage. We saw the buffet;¹¹ my soul kindled with a flame of indignation; and my hands were involuntarily¹² and convulsively clinched.

7. But when he came to touch on the patience, the forgiving meekness of our Savior; when he drew, to the life, his blessed eyes streaming in tears to heaven; his voice breathing to God a soft and gentle prayer of pardon on his enemies, "Father, forgive them, for they know not what they do," the voice of the preacher, which had all along faltered, grew fainter and fainter, until, his utterance being entirely obstructed by the force of his feelings, he raised his handkerchief to his eyes, and burst into a loud and irrepressible flood of grief. The effect was inconceivable. The whole house resounded with the mingled groans, and sobs, and shrieks of the congregation.

8. It was some time before the tumult had subsided so far as to permit him to proceed. Indeed, judging by the usual but fallacious¹³ standard of my own weakness, I began to be very uneasy for the situation of the preacher; for I could not conceive how he would be able to let his audience down from the height to which he had wound¹⁴ them, without impairing the solemnity and dignity of his subject, or perhaps shocking them by the abruptness of the fall. But the descent was as beautiful and sublime as the elevation had been rapid and enthusiastic.

9. The first sentence with which he broke the awful silence was a quotation from Rousseau. "Socrates died like a philosopher, but Jesus Christ like a God." I despair of giving you any idea of the effect produced by this short sentence, unless you could perfectly conceive the whole manner of the man, as well as the peculiar crisis in the discourse. Never before did I completely understand what Demosthenes meant by laying such stress on delivery.

10. You are to call to mind the pitch of passion and enthusiasm to which the congregation were raised; and then, the few minutes of portentous,¹⁵ death-like silence which reigned throughout the house; the preacher removing his white handkerchief from his aged face (even yet wet from the recent torrent of his tears), and slowly stretching forth the palsied hand which holds it, as he begins the sentence, "Socrates died like a philosopher," then pausing, raising his other hand, pressing them both, clasped together, with warmth and energy to his breast, lifting his "sightless balls" to heaven, and pouring his whole soul into his tremulous voice as he continues, "but Jesus Christ—like a God!" If he had been in deed and in truth an angel of light, the effect could scarcely have been more divine.

¹ PRE-TER-NAT'-Ū-RAL, unusual; extraordinary.

² SHRIV'-ELED, contracted into wrinkles.

³ PAL'SY, a disease that partially or wholly destroys voluntary motion or sensation.

⁴ AS-CER-TAIN'ED, showed; made plain.

⁵ SAC'-EA-MENT, the Lord's supper.

⁶ PAS'-SION (*pash'-un*), suffering.

⁷ PĀ'-THOS, a manner that awakens tender emotions.

⁸ "MYS'-TIC SYM'-BOLS," the bread and wine.

⁹ E-NUN-CI-Ā'-TION, manner of speaking.

¹⁰ "IN Ū'-NI-SŪN," in agreement; in harmony.

¹¹ BUF'-FET, a blow.

¹² IN-VOL'-UN-TA-RI-LY, without thought or will.

¹³ FAL-LĀ'-CIOUS, deceptive.

¹⁴ WOUND, gradually elevated.

¹⁵ POR-TENT'-OUS, that which threatens something ill.

LESSON XXI.

FATHER WILLIAM.

1. "You are old, Father William," the young man cried,
 "The few locks that are left you are gray;
 You are hale, Father William, a hearty old man,
 Now tell me the reason, I pray."

2. "In the days of my youth," Father William replied,
"I remembered that youth would fly fast;
And abused not my health and my vigor at first,
That I never might need them at last."
3. "You are old, Father William," the young man cried,
"And pleasures with youth pass away;
And yet you lament not the days that have gone,
Now tell me the reason, I pray."
4. "In the days of my youth," Father William replied,
"I remembered that youth could not last;
I thought of the future, whatever I did,
That I never might grieve for the past."
5. "You are old, Father William," the young man cried,
"And life must be hastening away;
You are cheerful, and love to converse upon death,
Now tell me the reason, I pray."
6. "I *am* cheerful, young man," Father William replied,
"Let the cause thy attention engage:
*In the days of my youth I remembered my God,
And he hath not forgotten my age.*"

SOUTHEY.

LESSON XXII.

JOHN LITTLEJOHN.

1. JOHN LITTLEJOHN was stanch and strong,
Upright and downright, scorning wrong;
He gave good weight, and paid his way,
He thought for himself, and he said his say;
Whenever a rascal strove to pass,
Instead of silver, a coin of brass,
He took his hammer, and said, with a frown,
"*The coin is spurious, nail it down.*"
2. John Littlejohn was firm and true,
You could not cheat him in "two and two;"
When foolish arguers, might and main,
Darkened and twisted the clear and plain,

He saw, through the mazes of their speech,
The simple truth beyond their reach ;
And crushing their logic, said, with a frown,
“ *Your coin is spurious, nail it down.*”

3. John Littlejohn maintained the right,
Through storm and shine, in the world's despite ;
When fools or quacks desired his vote,
Dosed him with arguments learned by rote,
Or by coaxing, threats, or promise, tried
To gain his support to the wrongful side,
“ *Nay, nay,*” said John, with an angry frown,
“ *Your coin is spurious, nail it down.*”
4. When told that kings had a right divine,
And that the people were herds of swine,
That nobles alone were fit to rule,
That the poor were unimproved by school,
That ceaseless toil was the proper fate
Of all but the wealthy and the great,
John shook his head, and said, with a frown,
“ *The coin is spurious, nail it down.*”
5. When told that events might justify
A false and crooked policy ;
That a decent hope of future good
Might excuse departure from rectitude ;
That a *lie*, if white, was a small offense,
To be forgiven by men of sense,
“ *Nay, nay,*” said John, with a sigh and a frown,
“ *The coin is spurious, nail it down.*”

CHARLES MACKAY.

LESSON XXIII.

THE VISION OF MIRZA.

1. ON the fifth day of the moon, which, (according to the custom of my forefathers, I always keep holy, after having washed myself, and offered up my morning devotions, I ascended the high hills of Bagdat, in order to pass the rest of

the day in meditation and prayer. As I was here airing myself on the tops of the mountains, I fell into a profound contemplation on the vanity of human life; and, passing from one thought to another, "Surely," said I, "man is but a shadow, and life a dream."

2. While I was thus musing, I cast my eyes toward the summit of a rock that was not far from me, where I discovered one in the habit of a shepherd, with a musical instrument in his hand. As I looked upon him he applied it to his lips, and began to play upon it. The sound of it was exceeding sweet, and wrought into a variety of tunes that were inexpressibly melodious, and altogether different from any thing I had ever heard. They put me in mind of those heavenly airs that are played to the departed souls of good men upon their first arrival in Paradise, to wear out the impressions of the last agonies, and qualify them for the pleasures of that happy place.

3. My heart melted away in secret raptures. I had been often told that the rock before me was the haunt of a Genius, and that several had been entertained with music, who had passed by it, but never heard that the musician had before made himself visible. When he had raised my thoughts, by those transporting airs which he played, to taste the pleasure of his conversation, as I looked upon him, like one astonished, he beckoned to me, and, by the waving of his hand, directed me to approach the place where he sat.

4. I drew near, with that reverence which is due to a superior nature; and, as my heart was entirely subdued by the captivating strains I had heard, I fell down at his feet and wept. The Genius smiled upon me with a look of compassion and affability that familiarized him to my imagination, and at once dispelled all the fears and apprehensions with which I approached him. He lifted me from the ground, and, taking me by the hand, "Mirza," said he, "I have heard thee in thy soliloquies: follow me."

5. He then led me to the highest pinnacle of the rock, and, placing me on the top of it, "Cast thy eyes eastward," said he, "and tell me what thou seest." "I see," said I, "a huge valley, and a prodigious tide of water rolling through it."

"The valley that thou seest," said he, "is the valley of misery, and the tide of water that thou seest is part of the great tide of eternity." "What is the reason," said I, "that the tide I see rises out of a thick mist at one end, and again loses itself in a thick mist at the other?"

6. "What thou seest," said he, "is that portion of eternity which is called time, measured out by the sun, and reaching from the beginning of the world to its consummation. Examine now," said he, "this sea, that is thus bounded with darkness at both ends, and tell me what thou discoverest in it." "I see a bridge," said I, "standing in the midst of the tide." "The bridge thou seest," said he, "is human life: consider it attentively." Upon a more leisurely survey of it, I found that it consisted of threescore and ten entire arches, with several broken arches, which, added to those that were entire, made up the number about a hundred.

7. As I was counting the arches, the Genius told me that this bridge consisted at first of a thousand arches, but that a great flood swept away the rest, and left the bridge in the ruinous condition I now beheld it. "But tell me farther," said he, "what thou discoverest on it." "I see multitudes of people passing over it," said I, "and a black cloud hanging on each end of it."

8. As I looked more attentively, I saw several of the passengers dropping through the bridge into the great tide that flowed underneath it; and, upon farther examination, perceived there were innumerable trap-doors that lay concealed in the bridge, which the passengers no sooner trod upon than they fell through them into the tide, and immediately disappeared. These hidden pitfalls were set very thick at the entrance of the bridge, so that throngs of people no sooner broke through the cloud than many of them fell into them. They grew thinner toward the middle, but multiplied and lay closer together toward the end of the arches that were entire.

9. There were, indeed, some persons, but their number was very small, that continued a kind of hobbling march on the broken arches, but fell through, one after another, being quite tired and spent with so long a walk. I passed some

time in the contemplation of this wonderful structure, and the great variety of objects which it presented.

10. My heart was filled with a deep melancholy to see several dropping, unexpectedly, in the midst of mirth and jollity, and catching by every thing that stood by them to save themselves. Some were looking up toward the heavens in a thoughtful posture, and, in the midst of a speculation, stumbled and fell out of sight. Multitudes were very busy in the pursuit of bubbles, that glittered in their eyes and danced before them; but often, when they thought themselves within the reach of them, their footing failed, and down they sunk.

11. In this confusion of objects, I observed some with cimeters in their hands, and others with lancets, who ran to and fro upon the bridge, thrusting several persons on trap-doors which did not seem to lie in their way, and which they might have escaped had they not been thus forced upon them.

12. The Genius, seeing me indulge myself in this melancholy prospect, told me I had dwelt long enough upon it. "Take thine eyes off the bridge," said he, "and tell me if thou yet seest any thing thou dost not comprehend." Upon looking up, "What mean," said I, "those great flights of birds that are perpetually hovering about the bridge, and settling upon it from time to time? I see vultures, harpies, ravens, cormorants, and, among many other feathered creatures, several little winged boys, that perch, in great numbers, upon the middle arches."

13. "These," said the Genius, "are Envy, Avarice, Superstition, Despair, Love, with the like cares and passions that infest human life." I here fetched a deep sigh. "Alas!" said I, "man was made in vain! how is he given away to misery and mortality! tortured in life, and swallowed up in death!" The Genius, being moved with compassion toward me, bid me quit so uncomfortable a prospect. "Look no more," said he, "on man in the first stage of his existence, in his setting out for eternity, but cast thine eye on that thick mist, into which the tide bears the several generations of mortals that fall into it."

14. I directed my sight as I was ordered, and, whether or no the good Genius strengthened it with any supernatural force, or dissipated part of the mist, that was before too thick for the eye to penetrate, I saw the valley opening at the farther end, and spreading forth into an immense ocean, that had a huge rock of adamant running through the midst of it, and dividing it into two equal parts. The clouds still rested on one half of it, insomuch that I could discover nothing in it; but the other appeared to me a vast ocean, planted with innumerable islands, that were covered with fruits and flowers, and interwoven with a thousand little shining seas, that ran among them.

15. I could see persons dressed in glorious habits, with garlands upon their heads, passing among the trees, lying down by the sides of fountains, or resting on beds of flowers; and could hear a confused harmony of singing birds, falling waters, human voices, and musical instruments. Gladness grew in me upon the discovery of so delightful a scene. I wished for the wings of an eagle, that I might fly away to those happy seats; but the Genius told me there was no passage to them except through the gates of death, that I saw opening every moment upon the bridge.

16. "The islands," said he, "that lie so fresh and green before thee, and with which the whole face of the ocean appears spotted, as far as thou canst see, are more in number than the sands on the sea-shore. There are myriads of islands behind those which thou here discoverest, reaching farther than thine eye or even thine imagination can extend itself. These are the mansions of good men after death, who, according to the degrees and kinds of virtue in which they excelled, are distributed among these several islands, which abound with pleasures of different kinds and degrees, suitable to the relishes and perfections of those who are settled in them. Every island is a paradise accommodated to its respective inhabitants.

17. "Are not these, oh Mirza, habitations worth contending for? Does life appear miserable, that gives thee opportunities of earning such a reward? Is death to be feared, that will convey thee to so happy an existence? Think not man

was made in vain, who has such an eternity reserved for him." I gazed with inexpressible pleasure on those happy islands. At length, said I, "Show me now, I beseech thee, the secrets that lie under those dark clouds that cover the ocean on the other side of the rock of adamant."

18. The Genius making me no answer, I turned about to address myself to him a second time, but I found that he had left me. I then turned again to the vision which I had been so long contemplating; but, instead of the rolling tide, the arched bridge, and the happy islands, I saw nothing but the long, hollow valley of Bagdat, with oxen, sheep, and camels grazing upon the sides of it.

ADDISON.

LESSON XXIV.

CHRIST'S SECOND COMING.

1. THE Lord shall come! The earth shall quake
The mountains to their centre shake;
And, withering from the vault of night,
The stars shall pale their feeble light.
The Lord shall come! a dreadful form,
With rainbow wreath and robes of storm,
On cherub wings, and wings of wind,
Appointed Judge of all mankind.
2. Can this be He, who wont to stray
A pilgrim on the world's highway,
Oppress'd by power, and mock'd by pride,
The Nazarene—the crucified?
While sinners in despair shall call,
"Rocks, hide us; mountains, on us fall!"
The saints, ascending from the tomb,
Shall joyful sing, "The Lord is come!"

3. "And they said to the mountains and rocks, Fall on us, and hide us from the face of him that sitteth on the throne, and from the wrath of the Lamb: for the great day of his wrath is come, and who shall be able to stand?"—Rev., vi., 16, 17.

PART V.

FIRST DIVISION OF NATURAL PHILOSOPHY.

[This subject is continued in the Fifth Reader.]

LESSON I.



THE SCHOOL AT GLENWILD.

1. In the delightful retreat of Glenwild, near a small village in one of the middle states of our Union, resided Mr. and Mrs. Maynard, who had a select family school of some twenty pupils. A leading object with Mr. and Mrs. M. in opening the school was the education of their own children, who were Master Edward, a lad of nine years, Charles, a lad of eleven, and Ella, their only daughter, who had just entered her fourteenth year.

2. The building occupied as the school and dwelling-house was a venerable¹ mansion, built in the old Dutch style, with gambrel² roof and dormer³ windows, and a wide piazza extending the whole length of the side of the house, where was the main entrance. A beautiful lawn spread out in front, bordered on the left by a rivulet from the hills, which formed a pretty waterfall where it entered the glen below, while on the right a sturdy oak, that had probably withstood the storms of five hundred winters, lifted its gnarled⁴ but still luxuriant branches to the sky.

3. In the background, groves of chestnut and maple, skirting the hills, were relieved by the deeper green of an occasional towering pine or hemlock; a quiet stream, which modern geographers have not even deigned to notice, but which was known in that region as "The River," wound its peaceful way through meadow-lands in a long line of silvery brightness; and from both sides of the valley arose undulating⁵ highlands, stretching away to the southward in gentle ridges, and blending, in the distance, into the bolder outlines of the Alleghanies.

4. The most charming nook in all this secluded and peaceful valley was Glenwild, situated just above the point where "The River" enters a wild and rocky glen; and this delightful spot Mr. Maynard had chosen for his home, and his family school; and here, partially withdrawing himself from the busy world, he devoted all the energies of a powerful and well-trained intellect to the business of educating his own children, and a few others committed to his care.

5. Mr. Maynard was a teacher who really loved his youthful charge; and this, combined with the vast fund⁶ of information which he possessed, and the delight which he took in imparting⁷ knowledge to the young, was doubtless the reason why he was so beloved by his pupils. A consistent Christian, he was also a devoted⁸ student of Nature, reading lessons of wisdom in all her works; and he had the peculiar faculty of inspiring others with a portion of his own enthusiasm for the pursuits of science.

6. This model man and teacher was the almost constant companion of his pupils, to whom nothing was more delight-

ful than to be told all they wished to know; and he who joined them in their pastimes,⁹ who accompanied them in their rambles, who flew their kites, helped construct their water-wheels and wind-mills, who artfully drew forth and answered all the thousand and one questions of prattling, inquisitive childhood, was the loved and guardian genius of the little group.

7. In such a school, and with such a teacher, it is not surprising that the branches studied, even by the younger pupils, were numerous and important, and such as are often deemed tedious and uninviting by those who have merely the barren tree of knowledge presented them, stripped of both fruit and foliage. But Mr. M. did not limit his educational views and labors to the duties of the school-room. The various plans which he suggested to his pupils for their hours of recreation were wisely designed for opening to their view some of the most interesting fields of knowledge.

8. It was in the various departments of natural history, especially, that the pupils of Mr. Maynard found a fund of combined information and amusement that tasked¹⁰ all their energies without ever wearying them. Nature was to them a vast bazar¹¹—a curiosity shop from which they had collected a miniature¹² one of their own. They knew at sight the kinds of trees that grew in the woodlands around, and could tell both their botanical and their common names; not a flower did they pass in their rambles without inquiring of their teacher its name and properties; and each had collected a neat herbarium¹³ of his own; and from the stream, the glen, and the hill-side, they had made a handsome collection of specimens for a geological cabinet.

9. They could tell the names and characteristics of all the songsters that warbled in the neighboring groves, and of the fish that filled the streams; while the thousand insects that sported in the summer air were, to them, objects, not of annoyance or curiosity merely, but of rational amusement and instruction; and their numerous entomological¹⁴ specimens would have done credit to older naturalists than they were. How surprising it is that all teachers do not cultivate for their own gratification, and instruct their pupils in a science

so rich in interest, so abundant in ready materials for its prosecution, and so impressive of the lesson that we live "in a bright and breathing world."

10. Like all things else, a walk of a summer's evening was turned to profitable account. Nothing could be more interesting to these children than to listen to the mysteries of the heavens, as they were unfolded¹⁵ by their beloved teacher. And as they learned the names, distances, and revolutions of some of the visible planets, were they not taking lessons in the sublime science of *astronomy*? And while, with newborn rapture, they gazed upon "the multitude of the heavenly host,

"Forever singing as they shine,
The hand that made us is divine,"

what question was more naturally suggested to their inquiring minds than this: "*Who made them all?*" And what would be more likely to direct their thoughts upward from Nature to Nature's God?

11. But we must close our description. With a teacher whose whole soul was imbued¹⁶ with science—prodigal¹⁷ of his intellectual wealth—"his bounty boundless as the sea, his love as deep"—what branch of useful knowledge would be neglected in his constant intercourse with his pupils? Every object in nature, however seemingly insignificant—it might be a blade of grass, an insect's wing, a dew-drop, or a mote that floats in the sunbeam—would elicit¹⁸ inquiry, awaken thought, and lead to the explanation of interesting truths in philosophy; for those who early form habits of constant observation, and cultivate an inquiring state of mind, will find

"Books in the running brooks, sermons in stones,
And good in every thing."

1 VĒN'-ER-A-BLE, deserving of respect on account of its age and appearance.

2 GAM'-BREL, having a double roof on each side.

3 DOE'-MEE, a window placed in a small gable in the roof.

4 GNĀRL'ED, knotty; full of knots.

5 UN'-DU-LĀ-TING, rising and falling; having a wavy outline.

6 FUND, abundance.

7 IM-PĀET'-ING, communicating.

8 DE-VŌT'-ED, ardent; zealous.

9 PĀS'-TĪMES, sports; amusements.

10 TĀSK'ED, called into exercise.

11 BA-ZĀE', market-place; store-house.

12 MIN'-I-A-TURE, one on a small scale.

13 HER-BĀ'-RI-UM, a collection of plants carefully dried and preserved.

14 EN-TO-MO-LOĒ'-IC-AL, pertaining to the science of insects.

15 UN-FOLD'-ED, explained; displayed.

16 IM-BŪ'ED, filled with; tinged or colored deeply, as, to imbue cloth.

17 PROD'-I-GAL, using freely; lavish.

18 E-LIO'-IT, call forth.

LESSON II.

THE VOLUNTEER PHILOSOPHY CLASS.



George.

Ella.
Ida.

Mr. Maynard.

John.

Frank.

1. "HAPPY the man, who, studying Nature's laws,
Through known effects can trace the secret cause.'

"Who was the author of these two lines?" said Mr. Maynard to five intelligent and attentive pupils, who had requested him to meet them every Saturday morning for the purpose of instruction in Natural Philosophy. This volunteer philosophy class was composed of three boys and two girls, who had solicited¹ from him the favor of an hour's extra instruction once a week.

2. The request was most cheerfully complied with by the kind preceptor, who was never weary of the company of wisdom-loving scholars. The class consisted of Masters *Frank*, *George*, and *John*, and Misses *Ida* and *Ella*. Frank had al-

ways lived in a city, and had the name of being a good Latin scholar for a lad of fifteen. George, who was the son of a farmer near Glenwild, was fourteen years old, and was called good at figures, while John, whose father was a miller some miles up the valley, had astonished the gazing rustics by the ingenious contrivances he had introduced into a model mill, constructed by his own hands before he was thirteen years of age. He was now seventeen.

3. Ida, who was fifteen, had studied philosophy at a fashionable boarding-school, where they had a new and easy conveyance up the hill of science, something after the style of a sedan chair, in which she had paid her fare. Ella, as we have said, was the daughter of Mr. Maynard, and, from her familiarity with various pieces of apparatus, had gained many ideas of the study which she now for the first time engaged in; but she thought herself but a beginner, as her first lesson had not yet been recited.

4. "Who was the author of the lines I just repeated?" said Mr. M. "Virgil said about the same thing," replied Frank. "Right," said the teacher; "and the study is no less pleasing to boys and girls than to men, and no less pleasing now than it was two thousand years ago. Yes, Virgil was right. The study that leads to the explanation of the general properties² of bodies, and the laws which they obey, is most delightful.

5. "The word *philosophy*," continued Mr. Maynard, "means a *love of wisdom* or *knowledge*; and one who consistently applies himself to acquire it is a *philosopher*, or lover of knowledge. Like Norval's father, 'whose constant care was to increase his store,' the student of philosophy should constantly seek to know the causes of things.

6. "As all our knowledge of things around us is derived³ through the medium⁴ of the senses—*seeing, feeling, hearing, tasting, and smelling*, and we may add *lifting*—the advice of Brutus to the Romans, 'Awake your senses, that you may the better judge,' applies to those who would study philosophy. They should be accurate observers of Nature; and in the boundless field which Nature opens they will find abundant materials to interest and instruct them.

7. "But let me explain to you, my young pupils, the nature of the study we are about to engage in. We shall have to learn why the balloon rises in the air, as well as why the diving-bell sinks in the water; how images are reflected from mirrors, or permanently fixed on metal or paper by the photographer;⁵ why water rises in a common pump, or is thrown by engines on the blazing building; how invisible wonders are revealed by the microscope, and the myriads of stars, unseen by the naked eye, appear by aid of the telescope; how, by the same wind, vessels can sail in opposite directions; what turns the needle toward the pole, or conveys intelligence with lightning speed; the causes of clouds and rainbows; of winds, and dew, and rain; of thunder and of lightning. The barometer, the thermometer, and the various instruments of modern scientific investigation will also claim our attention."

8. Here Miss Ida ventured to remark that she had often seen the expression, "the charms of Nature," and had always supposed the *study* of Nature was more poetical than philosophical—that it treated of such things as beautiful scenery, and birds, and flowers, and winding streams, and cooling fountains; and that, while it was a very pleasant and agreeable study, it was not particularly *useful*.

9. "I am not surprised," said Mr. Maynard, "that you should have entertained⁶ this view of the study of Nature, for it is the view most frequently expressed in poetry; but it is only a partial view of that great subject. We shall find, as Hamlet expresses it, that 'there are more things in heaven and earth than are dreamed of in our philosophy,' if our knowledge of Nature has been limited to its outward aspects,⁷ to the neglect of the great principles and laws, of which the 'charms of Nature' that you speak of are merely the outward expression."

10. Ida did not seem fully to understand these remarks, and Mr. Maynard continued: "It will afford me much pleasure to illustrate the truths of philosophy by many pleasing and instructive experiments, as we meet from time to time. I will assign you a subject for our next interview, and hope you will find out all you can about it from any books you may have on Philosophy, as well as from conversation with

your schoolmates and others. In order to aid you in your pleasant task, I will allow you to examine any books in my own library, and I assure you you will find much interesting matter for our conversations in books not called Philosophies. Our first topic will be the *Properties of Matter*."

11. With this introductory explanation of the nature of the subject, Mr. Maynard dismissed his pupils, who, however, stopped a short time on the lawn in front of the building, talking over various topics which his remarks had suggested. Then they separated to make preparations for the enjoyment of their Saturday's holiday. Ida and Ella, accompanied by Frank, and Ella's younger brothers Edward and Charles, were going down the glen to gather wild flowers; and John and George were going, as usual, to their respective homes to pass the Sabbath, and return to school on the Monday following.

¹ SO-LĪC'-IT-ED, earnestly requested.

² PROP'-ER-TIES, the peculiar or essential qualities of a thing; thus, extension and figure are *properties* of bodies.

³ DE-RĪVED', received; obtained.

⁴ ME'-DI-UM, the means or instrument.

⁵ PHO-TOG'-RA-PHER, one who takes pictures by the daguerreotype.

⁶ EN-TER-TAIN'ED, had; had in mind.

⁷ AS'-PECTS, appearances.

LESSON III.

THE PROPERTIES OF MATTER.

1. SATURDAY morning having arrived, the members of our Volunteer Philosophy Class were again assembled in the library at the hour appointed. As they had frequently talked over the subject of the lesson with each other during the week, and had found some difficulties attending it, the remarks of the teacher were looked forward to with much interest. Mr. Maynard, having requested them to be seated, thus began:

2. *Mr. M.* Strange as it may seem to you, my young pupils, some learned men have denied the existence of every kind of matter whatever. Berkeley, the ingenious Bishop of Cloyne, whose portrait is conspicuous in the Trumbull Gallery of Paintings in Yale College, was one of those philosophers who in earnest argument denied that there is any matter. Of him Byron wrote,

“When Bishop Berkeley said, ‘There was no matter,’
And proved it, ’twas no matter what he said.”

3. I have heard of the following sensible answers to two important questions. “*What is matter? Never mind. What is mind? No matter.*” But who will answer the question, “What is matter?”

4. *Ida.* All things which we see or feel are composed¹ of matter.

Mr. M. That is doubtless true, and yet it is hardly a definition. It is difficult to define matter in few words, but we may say it is the substance of which all bodies are composed. It may exist either in the form of a *solid*, as ice, or in a *liquid* state, as water, or in a *gaseous* condition, as steam, and yet be the same matter. Can you think of any matter that does not occupy some space?

5. *John.* I can not. I was thinking the other day of the space occupied by the finest particle of the finest flour; that it must be *something*, since enough of these particles may be collected to fill a barrel or freight² a ship.

Mr. M. And did it occur to you, John, that what you call a particle of the finest flour is itself composed of millions of atoms, of which there are at least three different kinds in the fine flour dust’?

John. I can not think of atoms so small as they must be.

6. *Mr. M.* I hope that before you leave this school you will be able to think of the atoms of the flour dust, and not only that, but think of an atom of one kind as being eight times the weight of an atom of another kind. Science³ will enable us to weigh the atoms, invisible⁴ though they are, in relative terms; and also to weigh the earth, moon, planets, comets, and even the sun. But if *every atom* of matter must occupy *some space*, can *two* atoms occupy the *same space* at the *same time*’?

7. *George.* No, sir; and is not this the very property called in the books impenetrability?⁵

Mr. M. It is; and the property of occupying *some space* is called extension. As without these two properties we can form no idea of matter, they are said to be inseparable or essential properties. Tell me why the water does not rise in

the inverted⁶ tumbler which I plunge beneath the surface of water in the basin.

8. *John*. Because the tumbler is filled with air, which is one kind of matter, and also owing to the principle of impenetrability; for water and air can not occupy the same space at the same time. I saw a boy who had just entered a drug store as assistant attempt to fill a bottle through a closely-fitting funnel;⁷ but the liquid rose up in the funnel, and would not run into the bottle till he attempted to withdraw the funnel, when it was quickly emptied. I think that must have been a dear experiment to him, as the liquid was a strong acid, which ruined his clothes, as it ran over the bottle on the removal of the funnel.

9. *Mr. M.* Yes, that illustrated the impenetrability of air to the liquid; and very probably, if you had seen the conclusion of the dear experiment, you would have witnessed the breaking of the bottle by the effort to force into the neck a closely-fitting cork when the bottle was already full; and this would have afforded an illustration⁸ of the impenetrability of a liquid to a solid.

George. I think the boy should have taken a few lessons in philosophy before entering upon such a *philosophical* business.

10. *Mr. M.* *All we do* is in accordance with, or in violation of philosophical principles, many of which we shall discuss in these conversations. Whenever we succeed, or have good luck, it is because we observe those principles; and when we fail, it is because we violate them, or act in ignorance of their existence. There are other properties, which do not seem essential to our ideas of matter, and which are nevertheless *general* properties of matter, or, as they are sometimes called, *accidental* properties. These are *divisibility*,⁹ *porosity*,¹⁰ *inertia*,¹¹ *figure*, and *attraction*.

11. *Ida*. I learned these as *essential* properties of matter.

Mr. M. It may not be of much importance to us now to discuss that point, but can you not think of an *atom*, or indivisible particle? If so, divisibility is not an *essential* property; for matter may exist without being divisible.

Frank. I have been puzzled to know what is meant in the books by such words as *atom*, *molecule*,¹² and *particle*.

12. *Mr. M.* I am glad you have asked the question ; for the most important thing in starting is to know what we are talking about, and I urge you always to obtain clear definitions of terms. The word *atom* means any thing that can not be cut or divided. It is the smallest part of a body. A number of *atoms* form a *molecule*, and a number of *molecules* form a *particle*. Please remember this. I now desire to hear from each of you the most surprising instance of division of matter that you have been able to find.

13. *Ida.* A single grain of musk will perfume a room for many years and still be a grain of musk. I suppose, wherever the musk is perceived, there must be particles enough to affect the sense of smell.

Ella. The thread of a spider's web, which I can scarcely see, is composed of 6000 single threads, according to the books, though I do not know how any body can see and count them.

14. *Frank.* One grain of carmine¹³ will tinge ten pounds of water so that the color may be seen. I have also read that two grains of silk have been spun into a thread 300 yards in length.

John. A single grain of gold has been divided into three million six hundred thousand parts, each visible through a microscope magnifying 500 times.

George. Dogs pursue their game by means of odors imperceptible¹⁴ by man, and I suppose these odors must consist of very minute atoms or particles of matter diffused through the air.

Frank. There is another interesting example of *practical* divisibility which I had forgotten to mention. I have seen it stated that artists, aided by the microscope, have ruled parallel lines upon glass, with a diamond point, so close to each other that ten thousand are contained in a single inch.

15. *Mr. M.* Your examples are well chosen. I will name but a single one. Ehrenberg has found the shells of animals so small that the one hundred and forty-fourth part of a cubic inch contained twenty-three millions of them ! These animals must have had limbs, and blood circulating through their tiny veins, and this blood was doubtless itself compounded of various kinds of molecules, each itself composed of atoms.

16. *John*. It seems scarcely possible that real live animals so small can exist!

Mr. M. When we take up the study of the "Microscopic World" we shall find stranger things than these to excite our wonder. The next property of matter is *porosity*. What do you understand by it?

John. It is the quality or state of having pores or openings in it. It means that the particles of matter are not close together, and the farther apart they are, the more *porous* is the substance. It is the opposite of *density*.¹⁵

17. *Mr. M*. Very well; and now each of you may give an example of porosity.

Ida. I have seen mercury forced through the pores of oak, and fall in a fine shower. That showed that the oak was porous or full of small holes.

Ella. We can put a large quantity of cotton into a tumbler completely *filled* with spirits of wine, and none of the liquid will overflow.

John. Salt can be put into water without increasing its bulk. This shows that the particles of water are not close together, and that there is room between them for the salt.

18. *Frank*. A pint of alcohol and a pint of water will not make a quart of mixture. I think this must be due to porosity also.

George. I have read that there are innumerable small pores in the skin, through which insensible perspiration passes.

Mr. M. It is evident that if there were no *porosity*, and the particles of matter were already close together, they could not be brought any closer together by pressure. Matter is therefore said to have the property of *compressibility*.¹⁶

Frank. Can matter in all of its three forms, *solid*, *liquid*, and *gaseous*, be compressed?

19. *Mr. M*. It can, though water is compressible only in a slight degree compared with air. Matter in every form can also be expanded by heat. But I perceive we shall not have time to finish the subject of the properties of matter during the hour, and we will therefore leave the remaining topics for our next conversation. In the mean time you will recollect that on next Saturday we are to talk about the remain-

ing general or accidental properties of matter, which are *inertia*, *figure*, and *attraction*; and if we have time we shall also call your attention to the *specific* properties of matter. I will not mention now what these properties are, but hope each of you will find out, and learn what you can about them.

¹ COM-PÔS'ED, formed; made of.

² FREIGHT (*frâte*), to load with goods.

³ SOÏ'ENCE, knowledge; a collection of the general principles or leading truths relating to any subject.

⁴ IN-VIS'-I-BLE, that can not be seen.

⁵ IM-PEN-E-TRA-BIL'-I-TY, that quality of matter by which it excludes all other matter from the space it occupies.

⁶ IN-VERT'-ED, turned upside down.

⁷ FUN'-NEL, a tunnel.

⁸ IL-LUS-TRÄ'-TION, that which explains or renders any thing more clear.

⁹ DI-VIS-I-BIL'-I-TY, the quality of being divisible.

¹⁰ PO-BOS'-I-TY.

[visible.

¹¹ IN-EE'-TIA (*in-er'-shü*).

¹² MOL'-E-CÜLE (or MÖLE'-CULE), a name given to the minute particles of bodies.

¹³ CÄR'-MINE, a beautiful red color.

¹⁴ IM-PER-CEP'-TI-BLE, that can not be perceived by the senses.

¹⁵ DENS'-I-TY, closeness or compactness of parts.

¹⁶ COM-PRESS-I-BIL'-I-TY, the quality of being brought into a smaller compass by pressure.

LESSON IV.

THE PROPERTIES OF MATTER—*Continued.*

1. THE class having assembled in the library as usual, Mr. Maynard asked John if he could describe that property of matter called *inertia*.

John. It is that property by which matter tends to retain its present state, whether of motion or rest.

Mr. M. True, that is the scientific definition; but can you show me that you understand the subject by giving illustrative examples of inertia?

2. *John.* Our mill never starts till some one lets the water on the wheel, and thus sets it in motion.

George. It is always harder for the horses to start a loaded wagon than to draw it when in motion.

Frank. I have seen a boy standing up in a cart fall backward when the cart was suddenly put in motion, and I think this must be due to the inertia of the boy.

3. *Ida.* I was once thrown from a horse by his starting suddenly forward.

Ella. Inertia is certainly a very *accidental* property, for I was once thrown over a horse's head, from his suddenly stopping when I had been riding rapidly.

4. *Mr. M.* A knowledge of the inertia of matter should make

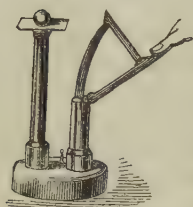


Fig. 1.

us cautious how we suddenly change our condition, either of motion or rest. I will show by experiment the inertia of a brass ball. I place a stiff card on a pillar, and then, by means of a spring, I drive the card from under the ball which was resting upon it. The ball will be found on the pillar, from which the card has been removed.

Whatever tends to change the state of matter, whether of rest or motion, is called *force*. There is also a property of matter called *figure*. Can you tell me what is meant by it?

5. *Frank*. I understand it to mean *form*, as all matter must have some *form* or *shape*.

Mr. M. True; and many bodies have forms peculiar to themselves, such as crystals. You perhaps recollect having seen crystals of common salt; and they are always cubical, or, as you might call them, square blocks. Liquids have no peculiar form, but assume¹ that of the vessel containing them. *Attraction* is another general property of matter. Sometimes *weight*, which is one kind of attraction, is called a distinct property; but we refer it to its proper place. Who will define *attraction*?

6. *Ida*. It is that quality in the particles of bodies which makes them tend toward each other.

Mr. M. I would prefer the words *atoms* and *masses* to *particles*, as they will include all kinds of attraction, from that called *chemical* to that called *gravitation* or *weight*. Attraction has received different names from the different circumstances under which it manifests² itself. Attraction between *atoms* is called *chemical affinity*; between *molecules*, it is termed *cohesion*; and between *masses*, *gravitation*. There is also a modification of attraction called *adhesion*,³ and another known as *capillarity*.⁴ Besides, there is *electrical* attraction, which will be hereafter explained. George, can you tell me why this pencil falls to the floor?

7. *George*. The pencil is a mass and the floor is a mass; and the pencil must fall toward the greater mass by the force of *gravitation*.

Mr. M. Very well; but you must remember that there are two *whys*, or two causes—a primary and a secondary, or an intelligent and a physical cause. The secondary or physical cause is gravitation, or a property to which we give this name; but the intelligent cause is nothing less than the “volition⁵ of Deity.” Besides these there are *specific* properties of matter, as I mentioned in our last conversation. Can any one of you tell what they are?

8. *Ella.* I have learned from the books in the library that there are such properties as hardness, elasticity,⁶ flexibility,⁷ brittleness,⁸ malleability,⁹ ductility,¹⁰ and tenacity;¹¹ but I do not exactly understand why they are called *specific* properties.

9. *Mr. M.* If you will reflect a moment that *specific* means that which distinguishes one kind from another, I think you will perceive that the term is a very appropriate one; for those properties which you mentioned do not belong in the same degree to all kinds of matter. *Inertia* belongs as much to one kind of matter as to another, and it is therefore a *general* property of matter; but does hardness belong, in the same degree, to all kinds of matter?

10. *Ella.* Oh no. I see the difference now. Some bodies are much harder than others, and therefore hardness is a *specific* property of matter; but inertia is a *general* property, belonging alike to all.

Mr. M. This illustrates the importance of understanding the precise meaning of terms. Will some one tell me the name of the hardest body known?

Frank. The diamond.

Mr. M. What bodies are elastic?

Ella. India-rubber, and steel springs.

11. *Mr. M.* And all other bodies to a certain extent, though some possess so little elasticity that they are called non-elastic. Air is perhaps the most perfectly elastic substance; but we have been using a term before defining it. What do you understand by elasticity?

12. *Ella.* The property by which bodies, when their form has been changed, endeavor to recover their original shape.

Mr. M. What is the difference between *flexibility* and *brittleness*?

George. When a body readily yields or bends under a force applied to it, it is said to be *flexible*; but if, instead of bending, it breaks, it is *brittle*.

13. *John.* I have seen knives and other tools very brittle when new, but very flexible when they had been heated, and have heard people say they had *lost their temper*.

Mr. M. Yes; when a piece of steel is heated, and then slowly cooled, it is flexible; but if cooled suddenly, it is brittle. You can try this experiment by heating and cooling a needle.

14. *John.* I recollect my father had a quantity of iron wire which he could not use because it was so brittle, and that he heated it red-hot, and cooled it slowly. I think he called it *annealing*.¹²

15. *Mr. M.* That is the name of the process. Glass can be annealed; and the value of glassware depends much on the manner in which it is cooled. *Malleability* is the property which allows bodies to be hammered or rolled into thin sheets. Do you know what is the most malleable substance?

16. *George.* Gold is considered the most malleable.

Mr. M. And what is most ductile, or can be drawn to the finest wire?

Frank. Platinum¹³ has been drawn into finer wire than any other substance I ever heard of.

17. *Mr. M.* What is tenacity?

Frank. I believe the word is derived from the Latin word *teneo, I hold*; and if so, it must mean the property of holding together.

John. I think I have heard that iron is the most tenacious of the metals.

18. *Mr. M.* Yes; iron wire is so tenacious that when only the sixteenth of an inch in diameter it will support 540 pounds, while a similar wire of lead will only sustain 27 pounds. The tenacity of iron makes it valuable in the construction of suspension bridges and other structures.

19. Here Mr. Maynard remarked that, although their hour had not quite expired, he would close this conversation, as he had promised to accompany a number of the younger pupils in a long ramble immediately after dinner, for the purpose of aiding them in making a map of the stream which flowed

through the valley. He informed the class that the subject of their next conversation would be MOTION AND ITS LAWS.

20. The means which Mr. Maynard adopted for interesting his pupils in a great variety of subjects of study were wisely contrived for combining amusement and instruction. With a view to such results, the excursion referred to had been planned for his younger pupils; and by such means they were early grounded in the principles of geographical knowledge, and interested in learning more of a subject whose very rudiments had proved to them a delightful recreation.

21. Thus, before his youthful pupils were aware that they were studying geography, they could tell the direction by the compass, and the distance from the old mansion, of every grove, fountain, and hillock for two miles around, the windings of the stream which flowed through the valley, the various ravines which entered the glen below, and could accurately trace on a slate or paper a map of the whole, the boundaries of the estate on which they resided, and a profile outline of the hills which separated their little world of tranquil beauty from the great and noisy world around them.

22. But they had visited many of the neighboring villages beyond the hills, and could locate¹⁴ them also; and as they inquired about distant cities and countries, and read, or heard related, interesting accounts of them and their people, they not only learned more of geography, but began the acquisition of historical knowledge. Thus, though secluded¹⁵ for a while from the noisy scenes of life, they were taught that, if their lives should be spared, they were soon to mingle with the moving throng, and that the duties of life required of them a knowledge of that world on whose stage of action they were soon to enter.

1 AS-SŪME', take the form of.

2 MAN'-I-FESTS, shows; exhibits.

3 AD-HE'-SION, the act or state of sticking.

4 CAP-IL-LAR'-I-TY, the attraction of a fluid up a small tube.

5 VO-LI'-TION, will.

6 E-LAS-TIC'-I-TY (see def. by Ella).

7 FLEX-I-BIL'-I-TY, the quality of admitting to be bent.

8 BRIT'-TLE-NESS, aptness to be broken.

9 MAL-LE-A-BIL'-I-TY, that property of bodies which renders them capable of being extended by *beating*.

10 DUC-TIL'-I-TY, that property of bodies which renders them capable of being extended by *drawing* without breaking.

11 TE-NAC'-I-TY, that property of bodies which keeps them from being parted without considerable force.

12 AN-NĒAL'-ING, the process of applying heat for removing brittleness.

13 PLAT'-I-NUM, the heaviest of the metals.

14 LO'-CATE, determine the place of; arrange on a map.

15 SE-CLŪ'-DED, shut out; living in retirement.

LESSON V.

MOTION AND ITS LAWS.

1. *Mr. M.* WHEN Plato, an ancient philosopher, was asked for a definition of motion, he is said to have arisen, and to have walked back and forth in the presence of his interrogators,¹ as much as to say, "You see it, but I can not tell you." Who of you will define *motion*?

Ida. Motion is a continued change of place with regard to a fixed point.

2. *Mr. M.* I would prefer to call *motion* simply *the act of changing place*, and consider it the condition of matter opposed to *rest*. It is enough for our purpose, however, that we understand the usual meaning of the term. Can you define *uniform motion*?

John. When a body passes over equal spaces in equal successive portions of time, its motion is called uniform.

3. *Mr. M.* Very well; now tell me when it is accelerated,² and when retarded.³

John. When the spaces passed over in equal times continually increase, the motion is called accelerated; and when such spaces decrease, it is called retarded; as a stone thrown up in the air is retarded in ascending, and accelerated in descending.

4. *Mr. M.* A good definition, and I think you understand it. Can you define *velocity*?

George. It is the swiftness of the motion, and is measured by the space passed over in a given time.

Mr. M. Now tell me what *momentum*⁴ is.

5. *George.* Momentum is the quantity of motion, and is the product⁵ of the quantity of matter by the velocity.

Mr. M. If that is so, a small body moving swiftly may have as much momentum as a large one moving slowly.

George. Yes, sir. A 32-pound ball, moving 1000 feet in a second, will have as much momentum as a battering-ram weighing 2000 pounds, and moving 16 feet in a second.

6. *Mr. M.* I am pleased to see you so promptly make the practical calculations illustrative of the principles of motion.

Suppose you were on the deck of a steam-boat going north at the rate of ten miles an hour, and that, when you were in the same straight line with two trees on shore, you were to run toward the stern of the boat with a speed of ten miles an hour, would you change position in respect to the trees?

7. *John*. Certainly not; for in the time occupied in running south, the boat would have advanced as far north as the space I passed over, and I should have remained at the same point in space.

Ella. Running ten miles an hour and standing still at the same time is strange enough. How is it explained?

8. *Mr. M*. The motion was *absolute*⁶ in regard to the *boat*, but not in respect to the *trees* on the shore. If you had remained at the same place on the boat, you would have been in motion in relation to objects on shore; and if you had started from the stern of the boat and run in the direction of the boat's motion with the velocity stated, you would have been going twenty miles in respect to the trees, and ten miles in respect to the boat.

9. *George*. This seeming paradox⁷ of *motion* and *rest*, or *rest* and *motion*, or motion *twenty* and *ten* miles at the same time, seems very plain to me when we use the terms relatively, or in comparison with other bodies.

10. *Mr. M*. If now you all understand what is meant by *uniform*, *accelerated*, *retarded*, *absolute*, and *relative* motion, as I think you do, I will only add that we do not know of any thing in a state of absolute rest. The earth on which we live is in rapid motion around the sun, and the sun itself is in motion around some central body, which, for aught we know, is itself revolving around some remote centre.

There are three principles of motion, known as Newton's Laws. Can you tell me the first?

11. *Frank*. "Every body continues in its state of rest, or of uniform motion in a straight line, unless acted upon by some external⁸ force." This, I suppose, means that a body at rest can not put itself in motion, and that a body in motion can not stop itself.

John. Then every thing at rest must always continue so unless moved by some force; and every thing in motion

must always continue moving unless stopped by some resistance.

12. *Mr. M.* You understand the exact meaning of the *first law*; now what forces tend to put bodies in motion, and what to stop them?

John. Mills are put in motion by horse-power, water-power, wind-power, and steam-power; so I would call the momentum of falling water, or of moving air, or the muscular power of animals, or the expansive force of steam, moving powers, or forces. Bodies in motion are stopped by the rubbing together of the surfaces in contact, and by the weight of the parts that have to be lifted.

13. *Mr. M.* That is, they are stopped by *friction*⁹ and *gravity*.¹⁰ George, can you give me the *second law of motion*?

George. "Change of motion is proportional to the force impressed,¹¹ and is in the direction of the line in which that force acts." When I load my gun with a charge adapted to the distance I wish to shoot, and aim in the direction of the object I wish to hit, I act upon the *second law of motion*, and did so before I ever heard of such a law.

14. *Mr. M.* I hope you would not insinuate that you are no wiser for your pains in learning the law you have repeated so correctly. I am very glad the Laws of Newton, as they are called, are self-evident to you, and I shall expect to hear some very sensible replies from you to the questions I shall have occasion to ask in the course of these lessons. There is another law for Frank to state and illustrate.

15. *Frank.* "Action and reaction are equal, and in opposite directions." If I understand what it means, it is that when I *pull* the reins in riding, I *push* as much as I *pull*.

George. If that is the case, how does he *stop* the horse?

16. *Frank.* Allow me to suggest that the soft reins do not hurt my hands as much as the same force, exerted by the small and hard bit, hurts the horse's mouth; so he concludes to stop.

Mr. M. A very sage conclusion, truly; but tell me, Frank, if you were sitting in the stern of a boat, and pulling by a rope attached to the bow, could you move the boat?

17. *Frank*. As the *pushing* and *pulling* would be equal, no motion would be produced.

Mr. M. If this string which I take from the table can sustain just seventy-five pounds before parting, and Ida and Ella can each pull seventy pounds, can they two break the string while pulling in opposite directions?

18. *Ida*. Yes, sir, we should break the string with our united force of 140 pounds.

Ella. No, sir; the string will only be pulled with a force of seventy pounds, just the same as if the other end were attached to a hook in the wall, instead of being held by Ida's hand.

19. *Mr. M.* Most certainly you could *not* break the string, for the two forces act in opposite directions, and one may be called *action*, and the other *reaction*. When Ella pulls with a force of seventy pounds, Ida merely sustains that force, the same as though her end of the string were fastened to the

wall. If I pull a string fastened to the wall, the wall pulls as much as I do. I must ask you to recollect these *laws of motion*, which seem so plain to you now, as we shall frequently have to refer to them hereafter.

The picture I now show



Fig. 2.

you will illustrate the principles of the three laws, and give you some idea of momentum.

20. *George*. Will you have the kindness, Mr. Maynard, to give us such familiar examples as occur to you to illustrate the laws of motion?

Mr. M. With the greatest pleasure. I will relate to you some from Dr. Arnott's interesting book on Physics:

21. If a man in one boat pull at a rope attached to another, the two boats will approach. If they be of equal size and load, they will both move at the same rate, in whichever of the boats the man may be; and if there be a difference in the sizes and resistances, there will be a corresponding difference in the velocities, the smaller boat moving the faster.

22. A magnet and a piece of iron attract each other equally, whatever disproportion there may be between the masses. If the two were hanging near each other as pendulums, they would approach and meet; but the little one would perform more than half of the journey.

23. A man in a boat pulling a rope attached to a large ship seems only to move the boat; but he really moves the ship a little; for, supposing the resistance of the ship to be just a thousand times greater than that of the boat, a thousand men in a thousand boats, pulling simultaneously¹² in the same manner, would make the ship meet them half way.

24. A pound of lead and the earth attract each other with equal force, but that force makes the lead approach sixteen feet in a second toward the earth, while the contrary motion of the earth is, of course, as much less than this as the earth is weightier than one pound, and is therefore unnoticed. Speaking strictly, it is true that even a feather falling lifts the earth toward it, and that a man jumping kicks the earth away.

25. He was a foolish man who thought he had found the means of commanding always a fair wind for his pleasure-boat by erecting an immense bellows in the stern. The bellows and sails acted against each other, and there was no motion. Indeed, in a perfect calm, there would be a little backward motion, because the sail would not catch all the wind from the bellows. If he had turned the bellows around, and blown astern,¹³ he might have moved his boat a little.

26. A ship in chase, by firing her bow guns, retards her motion; by firing from her stern she quickens it.

A ship, firing a broadside, heels or inclines to the opposite side.

A man pushing against the ground with a stick is pushed up as much as he pushes down.

27. When a child cries, on knocking his head against a table or pane of glass, it is common to tell him, and it is true, that he has given as hard a blow as he has received, although his philosophy probably, looking chiefly to results, blames the table for his head hurt, and his head for the glass broken.

28. When one billiard ball strikes directly another ball of

equal size, it stops, and the second ball proceeds with the whole velocity which the first had, the action which imparts the new motion being equal to the reaction which destroys the old.

29. But these examples are quite sufficient for our purpose. It only remains in this conversation to explain the laws of *reflected motion*, and what is called the *composition of forces*, or compound motion.

30. If a ball be dropped perpendicularly on a smooth pavement, it will rebound to a certain point in the same straight line in which it descended; but if it be thrown in some other direction against the pavement, it will not rise in a perpendicular line, but in a line having the same degree of obliquity¹⁴ as that in which it struck the pavement.

31. Thus, if the ball were dropped from a to the pavement at b , its upward course would be in the same line, ba ; but if it be thrown in the line cb , it will rebound in the line bd . In this case the angle formed by the line cb , with the line ab , is called the "angle of incidence," and that formed by the line db , with the line ab , "the angle of reflection;" and it is to be observed that these angles will always be precisely equal.



Fig. 3.

32. There are many interesting things about the composition of forces, some of which may be illustrated by the two diagrams which I show you. If two forces of equal intensity, but in opposite directions, act upon a given point, that point will remain motionless. But if the two forces act at an angle to each other, a motion is produced that is called the *resultant* of the two forces. Perhaps, John, you can explain the principle from these two diagrams.

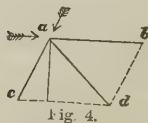


Fig. 4.

33. *John.* I think I can. If I understand the composition of forces, a ball at a acted on by forces moving in the direction of the arrows, will in each case be driven to d . In Fig. 4, however, the forces are unequal in intensity,¹⁵ one being represented by the line ac , and the other by the line ab . But in Fig. 5 the forces appear to be equal.*

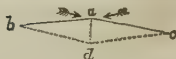


Fig. 5.

* On the same principles we can determine the common resultant of many forces act-

34. *Mr. M.* I believe you correctly understand the theory. The operations of every-day life afford numerous examples of the motion resulting from a composition of forces. If we attempt to row a boat directly across a rapid river, the action of the oars and the action of the current will result in a diagonal motion down the stream. In the science of projectiles, or of gunnery, it is necessary to take into consideration not only the force exerted by the powder, but of gravity, or the earth's attraction, also; for the cannon ball must take the direction of what is called the *resultant* of these two forces. This, however, brings us to the consideration of our next subject, which is GRAVITY AND FALLING BODIES; and on that you may prepare yourselves for our next conversation.

35. Here Master John remarked that Natural Philosophy was a most delightful study, because it led the mind to *think* about almost every thing.

"And to think with some satisfaction, too," said George, "because it puts one in the way of learning real *truths* about things; and I think nothing is so satisfactory as *truth*."

"I would like," said Ella, "to learn *the truth* about every thing in nature."

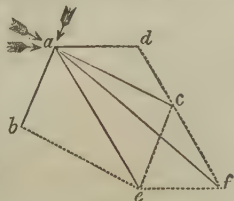
"That is a very large wish," said Frank, "for it seems to me to be a wish to know every thing."

"And that," said John, "is what Deity alone can know."

36. This was leading to quite a long discussion upon the nature of truth, when Mr. Maynard suggested that it might be well to postpone¹⁶ the consideration of that subject until they came to the departments of *Mental* and *Moral* Philosophy, which they would find treated in their Sixth Reader. The class then separated, and the several members proceeded to make preparations for their afternoon's rambles, which

ing on a point. Two of the forces are first taken, and their resultant found. This resultant is combined with the third force, and a second resultant found. This again is combined with the fourth force, and so on, until the forces are exhausted. The final resultant represents the conjoint action of all.

Thus, let there be three forces applied to the point *a*, represented in intensity and direction by the lines *ab*, *ac*, *ad*, respectively. If *ab* and *ac* be combined, they give as their resultant *ae*; and if this resultant, *ae*, be combined with the third force, *ad*, the resultant will be *af*, which, therefore, represents the common action of all three forces.



were so planned by their teacher as to have in view the acquisition of new truths in some of the departments of Natural History.

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|---|---|
| <p>1 IN-TER'-RO-GĀ-TORS, those who ask questions.</p> <p>2 AC-CEL'-ER-A-TED, quickened in motion.</p> <p>3 RE-TĀRD'-ED, hindered; delayed in motion.</p> <p>4 MO-MENT'-UM, the quantity of motion in a moving body.</p> <p>5 PROD'-UCT, here means the <i>result</i> obtained by multiplying the quantity of matter by the velocity.</p> <p>6 AB'-SO-LUTE, positive; real; <i>not relative</i>.</p> <p>7 PAR'-A-DOX, something seemingly absurd, but true in fact.</p> <p>8 EX-TEEN'-AL, outward; exterior.</p> | <p>9 FRIE'-TION, the act of rubbing the surface of one body against that of another.</p> <p>10 GRAV'-I-TY, weight; the tendency of a body toward the centre of the earth.</p> <p>11 IM-PRESS'-ED, exerted; made to act.</p> <p>12 SI-MUL-TĀ'-NE-OUS-LY, at the same time.</p> <p>13 A-STERN', from the stern or hinder part; backward.</p> <p>14 OB-LIQ'-UI-TY, deviation from a perpendicular line.</p> <p>15 IN-TENS'-I-TY, degree of violence, energy, or power.</p> <p>16 POST-PŌNE', put off; defer.</p> |
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LESSON VI.

GRAVITY AND FALLING BODIES.

1. WHILE the class were on their way to the library, Miss Ida remarked that it was so pleasant out of doors that morning she wished Mr. Maynard would give them their lesson under the old oak-tree on the lawn. This suggestion was very favorably received by the class, and on arriving at the library, and making known their wishes to Mr. Maynard that he would give them an out-door lesson, he very cheerfully complied with their request. So they all proceeded to the oak-tree, where Mr. Maynard took his seat in a chair which Frank had brought for him, and the others on the rustic benches which were placed there.

2. *Mr. M.* On the ground you observe acorns which have fallen from the tree above us. Will you tell me why they very appropriately suggest the consideration of the subject of gravity?

Ella. Because in falling from the tree to the earth they have illustrated the great law of falling bodies; and if there had been no such law as gravity, they would have been just as likely to go upward as downward.

3. *Frank.* I have another reason to give. I have seen it stated that while Newton was sitting alone in his garden, the falling of an apple from a tree suggested the inquiry, "*Why did the apple fall?*" and that this trifling circumstance led

to his great discovery of the laws of gravity, and of their application to the motions of the heavenly bodies. I think these acorns very naturally suggest a similar inquiry.

Mr. M. Reminded, by these evidences around us, of the constant operation of the laws of gravity, we will begin our lesson. In our last conversation John gave the example of a stone thrown upward as an illustration of retarded and accelerated motion. Can he now explain the cause of the increase of velocity in descending?

4. *John.* I have read that every body or mass of matter in the universe attracts every other mass, and that as the bodies approach each other the attraction is increased. I think this increase of attraction between the stone and earth, as they come nearer each other, is the cause of the accelerated motion of the stone in falling.

5. *Mr. M.* You have mistaken the cause of its accelerated motion; for, though it is true that the force of gravity increases as a body approaches the earth, the difference is so trifling at small distances from the surface as not to be perceptible. When a stone falls from a height, the impulse¹ which it receives from gravitation in the first instant of its fall would be sufficient to bring it to the ground with a *uniform* velocity, even if the force of gravity were then taken away; but as the force of gravity is exerted during the next instant also, the stone then receives an additional impulse downward, and so during each succeeding instant, and thus the motion is *uniformly accelerated*.

6. *John.* It is perfectly plain that, while the first impulse continues, gravity is constantly acting, and thus the velocity of a falling body is increased. I would like to ask if a stone occupies the same time in going up as in coming down.

7. *Mr. M.* It does; for in going up its force is constantly diminished by gravity. Can you tell me how many feet a body will fall in one second of time?

Ida. It is found by experiment that a body falls sixteen feet during the first second.

Mr. M. How far the next second?

8. *Ida.* Forty-eight feet, making sixty-four feet in the two seconds.

Handwritten: 1 inch of lead

Ella. It appears to me, then, by the principles just stated, that out of the forty-eight feet which the body falls during the *second* second, sixteen must be owing to gravity, the same as in the first second, and the remaining thirty-two feet to the *velocity* which the body had acquired in falling the first sixteen feet. Is not that so?

9. *Mr. M.* That is the correct explanation. The laws of falling bodies may be shown by triangles, as in this diagram,²

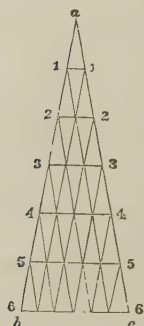


Fig. 6.

Figure 6. The acceleration of a falling mass may be represented by the divergence³ of the two sides, *a, b*, and *a, c*. If we divide the large triangle into smaller ones by the lines 1, 1, 2, 2, etc., which may represent seconds, the *bases* of the triangles which we thus make will show the acceleration at any required time, and the *areas*⁴ of the several smaller triangles will represent the space fallen through.

10. In such case the area of each smaller triangle must be considered 16, the number of feet which the body falls by the force of gravity alone; and the base must be called 32, the *velocity* which a body attains in falling 16 feet by the force of gravity alone. You see, by the figure, that in the first second there is *one* triangle, or the body falls 16 feet, and has a velocity at the end of the time of 32 feet. In the next second it passes over the space of *three* triangles, or 48 feet, and has a velocity of 64 feet. In the *third* second we have *five* triangles, or 80 feet, and a velocity of 96 feet.

In the same manner the velocity and spaces for any subsequent second in the fall of the body may be shown.

11. *Frank.* I thought the number of feet described⁵ during any portion of time was the product of the *square*⁶ of the time in seconds multiplied by 16, but I do not see how that follows from the figure.

12. *George.* I think I understand it. You have only to count the number of triangles above any line, and you will have the square of the time represented by that line. Thus, above the line 3 there are 9 triangles, and as each one is 16, the space above the line 3 is 9 times 16, or 144, which is the

space a body falls in three seconds, though it only falls 80 feet in the third second. Do you not see 5 triangles between lines 3 and 2?

13. *Frank.* Is it possible that we can extend that figure as far as we please, and work any problems⁷ of falling bodies by it?

Mr. M. Let us try a problem. How high is a flag-staff, if an arrow, thrown as high as its top, is *six seconds* in the air?

14. *George.* It will be as long in going up as in coming down; hence it will be falling *three seconds*. Three squared is nine, and nine times sixteen are one hundred and forty-four, the height of the staff.

Mr. M. Correctly solved; but with what velocity was the arrow shot upward?

15. *George.* I see in the figure three bases of the small triangles, and as each one represents 32 feet, the three will be 96 feet, which the arrow acquired in falling; that must equal the velocity which was destroyed by gravity in its ascent.

16. *Mr. M.* Do you observe from the figure that when the bases are doubled, the whole number of triangles above such bases is quadrupled?⁸ Thus, above the line 3 there are 9 triangles, and above the line 6 there are 4 times 9, or 36.

George. Can we not prove from that, that if a person doubles his charge of powder he can shoot four times as far upward?

17. *John.* Yes; and if I start to run up stairs with double the velocity of another boy, I can go up with one half the muscular exertion.

Frank. How can that be?

John. Do you not see that I can go four times as far by doubling the velocity, but to double the speed I must use twice as much force?

18. *Mr. M.* I have listened with interest to your discussion, and am pleased to see you so readily apprehend the doctrine of *falling bodies*; and I recommend you to construct and study such figures as the one I have described to you.

Ella. Do not heavy bodies fall swifter than light ones?

19. *Mr. M.* Practically they do; but if it were not for the

resistance of the air, all bodies would fall in the same times from the same height. I will show you the "guinea and feather" experiment. You observe that in this tall glass receiver, when it is full of air, the coin

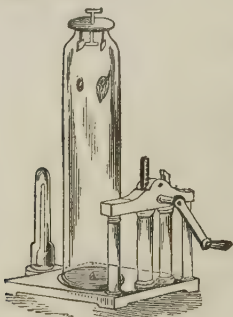


Fig. 7.

falls much more rapidly than the feather. I will now replace them, and exhaust⁹ the air from the receiver, and what do you observe as I detach¹⁰ them at the same time?

20. *Ella.* The feather seems as heavy as the coin, for they fell together.

Mr. M. So great is the resistance of the air when great surface is exposed to it, that people have descended from the height of two miles, by the aid of a kind of stout umbrella, called a *parachute*,¹¹ and gently touched the ground.

21. *Frank.* I have just read of a balloon which burst at a great elevation, and the aeronaut¹² came down in safety, as the balloon was held within the net-work in the form of a parachute.

22. *Mr. M.* An ancient poet, Lucretius, knew the resistance of air when he wrote,

"In water or in air, when weights descend,
The heavier weights more swiftly downward tend;
The limpid waves, the gales that gently play,
Yield to the weightier mass a readier way;
But if the weights in empty space should fall,
One common swiftness we should find in all."

23. You have perhaps heard the old proverb that "a child can throw a feather as far as Hercules," and you can doubtless see the reason in the resistance of the air.



Fig. 8.

There is another matter for explanation in this lesson, concerning what is called the *centre of gravity*.

Frank. As gravity is weight, the centre of gravity must be the same as the centre of weight, or the point where a body will balance.

24. *Mr. M.* It is the point about which all the parts balance each other; and if this point be supported, the whole body will be supported; otherwise the body will fall.



Fig. 9.

Elia. That must be the reason why the stage was upset the other day. Mr. Jones said it was dangerous to pile so many trunks on the top.

25. *Mr. M.* If you imagine a line drawn from the centre of gravity of a body, toward the centre of the earth, that line is called the *line of direction*. If that line fall within the *base* or support of a body, the body will stand; but if it does not come within the base, the body will fall. The centres of gravity in the figures shown in this cut are where the lines cross each other.



Fig. 10.

26. *John.* The figure *b* has the same base as *a*, but it can be more easily overturned. If it were about four times its present height, I do not think it could stand at all.

Ida. I have read of a *leaning tower* at Pisa, in Italy, which appears as if it were just ready to fall, and yet it has stood several hundred years.

27. *Mr. M.* This wonderful tower is one hundred and ninety feet high, and leans twelve feet; but this is less than half of its diameter; hence the line of direction falls within the base, as you see in the drawing which I show you (Fig. 11).

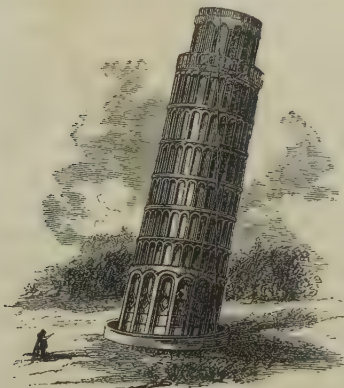


Fig. 11.—Leaning Tower of Pisa.

John. My father has often told me never to stand up in a small boat when the waves cause it to rock violently, as it would increase the danger of upsetting. I can now see that

standing up would elevate the centre of gravity, and that it would be much safer for all persons in the boat to keep as near the bottom of the boat as possible.

28. *Mr. M.* The principle that you would adopt to secure your own safety in a small boat is the same that is followed in the arrangement of the ballast and cargo of a ship. Ballast is some heavy material placed low down in the hold¹³ of a vessel to give it steadiness in the water.

29. *George.* Boys who walk on stilts, or attempt to stand on skates, can understand the importance of keeping the *line of direction* within the base; but I can not understand why it is so much easier to keep one's balance when moving swiftly, than when standing still.

30. *Frank.* I have noticed Mr. D. walks much faster after he has visited two or three grog-shops, than at other times; and I heard a person say that probably he could walk *straighter* by walking *faster*.

Ida. I know that a hoop will roll for a long time leaning much to one side, while it would fall at once if it were not in motion.



Fig. 12.
The Gyroscope.

31. *Ella.* I think my father's *gyroscope*¹⁴ is the most wonderful instance of a moving body supporting itself against gravity. Here it is, now. See me spin the heavy wheel rapidly around inside of the ring. The ring, wheel, and axle remain in a horizontal position; and not only that, but they revolve around the stem on which they rest. I would like to understand that.

32. *John.* Motion seems to play strange pranks with the centre of gravity. I know that by giving a quoit a whirling motion, I can make it strike much truer. I recollect reading of a crooked stick, called a *bommerang*, which the natives of Australia throw in a curved path, and even make it come around to them again.

33. *Mr. M.* Although you are wandering somewhat from the topic for to-day, I have listened with pleasure to the instances you have given of the curiosities of motion, and I shall not have a better opportunity than this to explain the mysteries of momentum, and show how

“The skater, *motion-poised*, may proudly swim
In air-borne circles o’er the glassy plain.”

You have seen that when two forces act on a body at the same time, their united effect is represented by a single force called a resultant.¹⁵

34. *John*. Yes, sir, we understood that, as it was explained under the head of *composition of forces*.

Mr. M. Are you aware that whenever the particles of a body are moving in any direction, it requires force to change the direction of the motion?

35. *John*. I think this is the reason why a quoit can be thrown more accurately when it has a whirling motion. When the slaters were repairing our roof, I noticed that when they threw any of the slates to the ground, they gave them a whirling motion, and that they would strike on the edge without being broken.

36. *Mr. M*. The rolling of the inclined hoop illustrates my point. Gravity can not overcome the tendency of the particles to continue on in the direction which has been given to them. There is a *composition of motions* as well as of *forces*; and do you not see that the particles in the wheel of the *gyroscope* are revolving in a vertical plane’, or direction’, by the impulse given in spinning the wheel’, while at the same instant the weight of the wheel tends to make it fall’?

37. As, when two forces act on a body, it will not move in the direction of either, but in a diagonal between them, so when a body in motion is under the influence of two forces, one to retain it in the direction of its motion, and the other to change that direction, it will obey neither, but go between them, and nearer one than the other, in proportion as one force is greater than the other. As one end of the axis¹⁶ of the wheel is supported, while the other tends to fall, the force of gravity is expended in giving to the instrument itself a rotary motion in a direction opposite that of the rim of the wheel.

38. I am aware that the explanation I have attempted requires more knowledge of philosophy than I could expect from you now, and I do not suppose you to understand so

difficult a matter clearly at present, but have thought best to point out the way that will lead you to an understanding of it in future.

39. *John.* I think the spinning of a top in a leaning position so long a time is explained on the same principle.

Mr. M. Yes; and not only the spinning of a top, but a grand astronomical motion, which requires about 25,000 years to accomplish one revolution. Do not forget this lesson when we come to the *Precession of the Equinoxes*, in Astronomy.

40. But, George, when you introduced the stilts and skates into this conversation, we all walked off from the immediate subject, to which it is time to return. We were speaking of the support of the centre of gravity. Can you give any instances of stability¹⁷ when the line of direction *seems* to fall without the base?

41. *Ella.* Those toys made of pith, and fashioned in the shape of soldiers, which rise up as often as we knock them down, have the centre of gravity very low down. I once had the curiosity to pick one to pieces, and found it well balanced¹⁸ with lead.

John. Just so the "old ship righted" when the wind had blown her on her "beam ends."

Mr. M. So, you see, there is philosophy every where.

42. *Ida.* I always like to see the graceful motions of those prancing toy horses, which are kept from falling by a weight attached to a stiff wire, and so placed as to fall nearly under the hind feet.

Mr. M. In this case, does the horse support the weight, or the weight support the horse?

43. *Frank.* I think the horse supports the weight, and the centre of gravity of the whole compound figure is within the leaden ball. (Fig. 13.)

John. Then the centre of gravity is not over the base.

Frank. It is *under* it, and the *line of direction* comes in the right place. In this case the motion is a swinging one, like a clock pendulum.



Fig. 13.

44. *Mr. M.* The reference to the clock pendulum reminds me that our hour has elapsed, and I shall expect you to come next week with what you can prepare on the subject of MECHANICAL POWERS.

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| <p>1 IM'-PULSE, force communicated. 2 DI'-A-GRAM, a figure drawn for the purpose of explaining some principle. 3 DI-VERG'-ENCE, a receding or separating from each other. 4 A'-RE-A, extent of surface. 5 DE-SCRIB'-ED, passed over. 6 "The square" of a number means the product of that number by itself. 7 PROB'-LEM, some question in mathematics requiring a solution. 8 QUAD'-RU-PLE, increased four fold. 9 EX-HAUST', draw out; remove. 10 DE-TACH', let loose; set free. 11 PAR'-A-CHUTE (<i>par'-a-shute</i>).</p> | <p>12 A'-ER-O-NAUT, one who sails or floats in the air; a balloonist. 13 HOLD, the whole interior cavity of a ship below the lower deck. 14 GY'-RO-SCOPE, an instrument for illustrating the phenomena of rotation and the composition of rotations. 15 RE-SULT'-ANT, that which results from the combination of two or more. 16 AX'-IS, that which passes through the centre of the wheel, and on which it revolves. 17 STA-BIL'-I-TY, strength to stand without being overthrown. 18 BAL'-LAST-ED, kept steady by ballast.</p> |
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LESSON VII.

MECHANICAL POWERS.*

1. *Mr. M.* The topic for this lesson will certainly be an interesting one to the young ladies who wish to know about scissors and sewing machines, as well as to the lad who knows all about mills, and the one who understands the mechanical¹ arrangements used in farm work; but as for Frank, who has spent his life thus far in his father's office and the Latin school, I can hardly expect that our mechanical lesson will be so pleasing to him.

2. *Frank.* But, Mr. Maynard, while I was reading Cæsar and Virgil, I found it necessary to know something about the mechanical powers, in order to understand the machines which the Romans used to batter down walls, and to discharge arrows, darts, and stones. I have constructed a model of Cæsar's bridge,² from his description of it; and also models of the catapulta, ballista, and scorpio;³ and I think no one can feel more desirous to understand the mechanical powers than I do.

3. *Mr. M.* Very well; I am glad to see that you appreciate⁴ the importance of such knowledge to a correct under-

* The *Mechanical Powers* are certain instruments or simple machines employed to facilitate the moving of weights, or the overcoming of resistance.

standing of what you read. What is a simple machine, Frank?

Frank. An instrument by which weights can be raised, resistance of heavy bodies overcome, and motion communicated to masses of matter.

4. *Mr. M.* A very good definition. How many primary *mechanical powers* are there?

John. Three; the *lever*, *pulley*, and *inclined plane*.

Mr. M. That is the division I prefer, as the *wheel and axle*, the *wedge*, and *screw*, are modifications⁵ of the first three. What is a *lever*?

George. A *lever* is an inflexible⁶ bar, supported on a point called a *fulcrum*,⁷ about which it moves freely.

5. *Mr. M.* I like to have you give the definitions so clearly. In the cut which I here show you, you see a man trying to move a heavy stone. Here L is the lever, F the fulcrum, W the weight. By pressing down at the end L, the other end of the lever raises W, the weight. The centre of motion is at F, the fulcrum. In other



Fig. 14.

words, the power or force resting on the prop or fulcrum overcomes the weight or resistance. Thus, if the lever be under the centre of gravity of the weight, and the length of the lever from the fulcrum be twice as long as the other part, a man can raise the weight one inch for every two inches he presses down the end of the lever.

6. I wish you to notice that there are four things to be considered, viz., the *power* applied, and its *distance* from the fulcrum; also the *weight* or resistance, and its *distance* from the fulcrum. Now if the stone weighs 500 pounds, and is two feet from the fulcrum, how much power must the man apply, at a distance of five feet from the fulcrum, in order to move the stone?

7. *John.* I have learned that in all such cases the product of the weight by its distance is equal to the product of the power by its distance; therefore I find the required power to be 200 pounds.

Ella. Please explain your work for our benefit, and not come to the conclusion so suddenly.

8. *John.* The weight 500, multiplied by its distance 2, is 1000. The product of the power by its distance must be equal to 1000. But the distance of the power is 5, hence the other factor, or the power, will be found by dividing 1000 by 5, which will give 200.

Ella. Are the calculations for all kinds of levers made so easily?

9. *Mr. M.* I am most happy to assure you that not only are all calculations pertaining to the *lever* thus simple, but also all calculations of the other simple mechanical powers. Do you understand this expression, $P \times Pd = W \times Wd$?*

10. *George.* I think it must mean that the product of *power* by *power's distance* from the fulcrum is equal to the product of the *weight* by the *weight's distance* from the fulcrum.

11. *Mr. M.* That is the law for equilibrium; but to produce motion the power must exceed that necessary for equilibrium or balancing. Universally, *the product of the power by the distance it moves is always equal to the product of the weight by the distance it moves in a vertical direction.* Whenever you have any difficulty in solving questions in mechanical powers, think of this principle.

12. *John.* Does not the *weight* of the long end of the *lever* interfere with this rule? I saw some engineers once weighing the *lever* of a safety-valve, and heard them say the rule for calculating *levers* would not do for them.

Mr. M. Very true; the *weight* of the lever is a part of the power, and should be so calculated. In the formula⁸ I have given you the lever is considered as without weight.

13. *John.* As all levers do really have weight, will you please show us how to estimate that weight in practice?

Mr. M. Have you not been able to find the information you seek in any school-books or mechanics' manuals?⁹

John. No, sir. I have searched diligently even in college text-books in your library.

14. *Mr. M.* I really can not point you to the book where

* This should be read, "P multiplied by Pd equals W multiplied by Wd."

you will find what you wish, and what is so important, but I think it can be made very plain. We will use this diagram for our illustration.

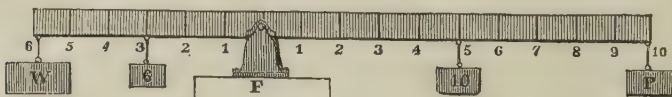


Fig. 15.

15. Suppose the lever to be a bar of iron sixteen inches long, every inch of which weighs one pound, and that the fulcrum, *F*, is six inches from the weight, *W*. The centre of gravity of the short arm will be three inches from the fulcrum, where the weight will be six pounds. The centre of the long arm will be five inches from the fulcrum, where its weight will be ten pounds. Now we have only to calculate the short end as an additional weight of six pounds three inches from the fulcrum, and the weight of the long arm as a power of ten pounds five inches distant, and combine these with the theoretical¹⁰ calculation.

16. *John*. I think I can now accomplish what I have heard many mechanics wish themselves able to do. The problem does not seem to be a very difficult one.

Mr. M. Will you tell me, then, with such a lever, what power at *P* will balance 100 pounds at *W*?

17. *John*. If we multiply 100 by 6 (six inches), we have 600. Then 6 pounds, the weight of the short arm of the lever, multiplied by 3 (three inches), will give 18, which, added to 600, will make 618, for the products of the weights by their distances. Then, for the long arm of the lever, we multiply the weight 10 by its distance 5, and take the product, 50, from 618, and this will leave 568 pounds to be balanced by a weight at *P*; but, as *P* is ten inches from the fulcrum, we divide 568 by 10, and this gives us 56 pounds and eight tenths of a pound.

18. *Mr. M*. You are correct in your answer. Fifty-six pounds and eight tenths of a pound at *P* will balance one hundred pounds at *W*. Can you tell me what would have been the theoretical answer?

Ida. I have already made the calculation, and I find, if we

suppose the bar or lever *not to have any weight*, 60 pounds at P will balance 100 at W.

19. *Mr. M.* Thus, you see, there is a difference of over three pounds. If the lever is not a straight and uniform bar, the distance of the centres of gravity of its arms must be calculated by means we can not introduce here.

Ida. I used to learn about three kinds of *levers*. Can the power of all of them be calculated in the same way?

20. *Mr. M.* Yes. Their parts are essentially the same; viz., the *power* and its *distance*, and the *weight* and its *distance* from the centre of motion; and the formula I gave will solve them all. Can you tell me what constitutes a lever of the second kind?

21. *George.* The *second kind of lever* is that in which the weight and the power are on the same side of the fulcrum, and the power is furthest from the fulcrum.

Thus, if a mason desires to move forward a large piece of stone, instead of bearing down upon the lever to raise it up a little, he sticks his crowbar into the ground, and pushing upward, moves the stone little by little onward, the ground being the fulcrum.



Fig. 16.

22. *John.* Is not a common wheelbarrow a kind of lever of this kind?

Mr. M. It is a lever on a rolling fulcrum. So, also, is the oar of a boat, the water being the fulcrum, the person who rows the power, and the boat itself the resistance.

23. *Frank.* It seems to me that the masts of a ship are levers.

Mr. M. So they are; and also the rudders by which ships are steered. Can the young ladies give me some examples of levers either of the first or second kind?

Ida. Nut-crackers and lemon-squeezers are levers of the second kind.

Ella. Scissors, forceps, and snuffers are double levers of the first kind.

24. *Mr. M.* Well said; for when you readily state the kind of levers, I think you understand what is the fulcrum, power, and weight. The *scale-beam* used in weighing is a simple

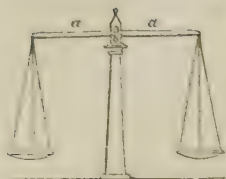


Fig. 17.

lever. The arms, *a a*, on each side, are made of equal length, and suspended over the centre of gravity. The axis¹¹ or pivot, *b*, which is the point of suspension, is sharpened to a very thin edge, that the beam may easily turn with as little friction as possible when weights are applied in the scales. Can

you give me a description of the third kind of lever?



Fig. 18.

25. *Frank*. The *third* kind of lever is that in which the fulcrum is at one end, the weight at the other, and the power placed between them. A man raising a ladder which rests on one end is an example; so, also, are *fire-tongs*. I have read that at one time this was called the *losing lever*, because the power had to be greater than the weight; but the advantages

of it are that a small power causes the extreme point of a long arm to move over a great space.

26. *Mr. M*. Yes; and it is one of those wonderful adaptations of the Divine Being in the construction of the limbs of animals. This arrangement is seen in all its beauty in the wings of birds, whose muscles are sometimes very powerful, sustaining the weight of their bodies while they travel unrested for days amid the tempests of the heavens.

27. *Ella*. We have had examples of this kind of lever in our reading-lessons in Ornithology, in the instances of the long-sustained flights of the stormy petrel and the albatross, and of the wild or passenger pigeon; and I see now that a knowledge of the lever makes those cases all the more interesting.

Mr. M. And perhaps some one of you can find an example of the same kind of lever in your reading-lessons on Human Physiology.

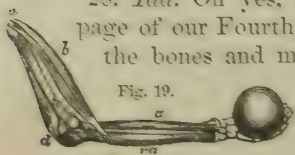


Fig. 19.

28. *Ida*. Oh yes, here it is, on the twenty-second page of our Fourth Reader. I see in the example of the bones and muscles of the arm that the elbow is the fulcrum, the muscles the moving power, and the weight raised the resistance.

Mr. M. You are right; and from the principles already learned you will perceive that if the weight in the hand be fifty pounds, and be raised twenty inches while the muscles springing from the shoulder contract one inch, the force exerted by the muscles must be equal to one thousand pounds.

John. I believe a horse draws a cart on the principle of the lever.

Mr. M. Yes; the weight of the horse is the power, especially in drawing up hill, and his hind feet constitute the fulcrum.

29. *George.* I understand now why, when one of our horses could not draw a cart up a short steep hill, the driver got on the forward part of the cart, and the horse drew up the man and cart, when he could not draw the cart alone. The *weight* of the man bearing on the back of the horse added to the *power*.

30. *Mr. M.* Is it not delightful to trace the causes of things? Gates, doors, and chests furnish us



Fig. 20.

illustrations of the principles we have been considering. You will find that a thousand common things are accomplished on the



Fig. 21.

principle of the lever. But we must proceed to the *pulley*; so what can you say of this power?

31. *Frank.* It is a small grooved wheel, with a cord passing over it.

Mr. M. What is gained by such a pulley?

Frank. Nothing but change of direction. A man, by pulling *down*, can raise a weight *up*.



Fig. 22.

John. Yes, and several men can join their strength at the same time to raise a very large weight.



Fig. 23.

32. *George.* By putting another pulley near the ground, horses and oxen can walk off horizontally and raise weights vertically. When I went to Washington last summer, I saw horses raising large blocks of marble, and iron pillars, to a great height on the Capitol.

33. *Mr. M.* Perhaps the pulley is of more advantage to the sailor than to man in any other occupation. Have you ever heard of a contrivance called a *fire escape*, by which a man could let himself down in safety from the lofty window of a burning house?

John. I never heard of one, but I can at once see how it could be done.



Fig. 24.

34. *Frank.* I have often seen workmen making some slight repairs to the walls of houses, with one end of a rope fastened around their bodies, and passing over a pulley, as you see in this figure.

Ella. I can see how he can balance himself, but I can not understand how he can draw himself up.

35. *Mr. M.* By a little exertion, he can throw more than half his weight on one side of the pulley, which makes that end of the rope descend, while the other rises; and, as the nursery rhyme says, "so he goes up, up, up," or "down, down, down," as he chooses.

George. I recollect a man went down into our deep well in that way.

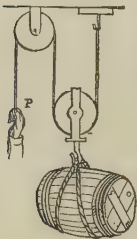


Fig. 25.

36. *Mr. M.* That was by means of a *fixed* pulley; but the mechanical *power* is a *movable* pulley, like the one I have here represented. The power, you will at once see, being held by a *single* rope, passes over *twice* the space of the weight, which is held by a *double* rope.

John. Then, by the way we calculate the powers of levers, the weight is *double* the power in this case.

37. *Mr. M.* I shall have to name you John Archimedes,¹² for I verily believe he would have reasoned in the same way. Do you not see that one pulley moves up just as the weight does, and that it doubles the power?

Ida. I have long known that a movable pulley has this effect, but I never understood it before.

38. *Mr. M.* Not *every* movable pulley, but only those that have one arranged as you see this. I

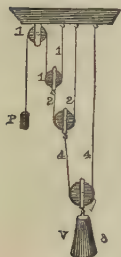


Fig. 26.

have here two movable pulleys with one rope passing over them. What will one pound at P balance at W?

Ida. Four pounds.

39. *Mr. M.* That is correct. I have again three movable pulleys, as in the figure: what will one pound at P balance at W?



Ida. I was about to say *six*, but I see it would be eight. The figures on the strings show the tension¹³ or weight at each place.

Ella. Does the power in the last example really move eight times as far as the weight is raised?

40. *Mr. M.* Exactly eight times as far whenever it is but one eighth as heavy.

John. Do workmen call them pulleys?

Mr. M. The ropes used about a pulley are called tackle, and the pulleys blocks; therefore, when a sailor or workman collects together all things necessary for the application of this machine, he speaks of the *block and tackle*.

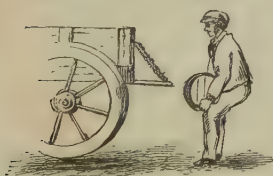
What is the next simple mechanical power?

Ella. The *Inclined Plane*.

Mr. M. And what is an *inclined plane*?

Frank. The book says it is a plain surface inclined¹⁴ to the horizon.¹⁵

41. *Mr. M.* That is true; but let us take a familiar example.



To lift barrels of flour into a cart from the ground would be rather hard work; but to roll them up an inclined plank or plane would be comparatively easy. Suppose the cart to be three feet

high, and the plane six feet long, how much power will be required to sustain a barrel of flour, weighing two hundred pounds, on the plane?

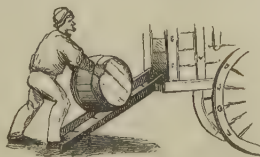


Fig. 29.

42. *George.* One hundred pounds, if the principle by which the lever is calculated applies; for, to roll it up, the power will have to follow the barrel the

length of the plane; but the barrel will only be raised the height of the cart in a vertical direction. Now if the weight be raised but half the space described by the power, it must be twice as great.

43. *Mr. M.* Very well explained indeed; and I must call you George Archimedes.

Frank. These mechanical powers are more like each other than one would have supposed.



Fig. 30.

44. *Mr. M.* The principle you so much admire, and so easily comprehend, is commonly known as the "law of virtual velocities," and I hope you will point out the first exception you find to this law. I expected to finish the subject of mechanics at this conversation, but find it necessary to continue the same subject in our next lesson.

45. "You have seen in this and the previous conversations," continued Mr. Maynard, as the class were about to separate, "that very common matters abound in philosophy; and, indeed, every thing that we can notice by any of our senses is capable of affording us some instruction. I will here remind you—what I have often said before—that it is of great importance to you in early life to cultivate such an inquiring state of mind as will not only incline you to *notice* every thing around you, but also to examine into the *causes* of things. By so doing you will find matters of interest in the most common things of life, and every thing will preach to you *philosophy*."

46. The system of education pursued by Mr. Maynard, and his great success in it, were such as to discredit¹⁶ the doctrine that pupils must entirely master one subject before entering upon another. Proceeding upon the idea that the human mind is not a unit in its operations, and that its harmonious development demands a great variety of subjects for the exercise of its varied powers, the range that he gave to his pupils in the domains of knowledge was a very extensive one. Like the honey-bee, they were led to pass from flower to flower in Na-

ture's boundless parterres,¹⁷ and gather sweets from all of them.

47. "Nature," said Mr. Maynard, "does not teach us the whole of one science before she imparts some knowledge of another. She has given us five senses, and it is our duty so to educate them that they may be faithful and 'swift-winged messengers' to convey to the mind perceptions¹⁸ of the surrounding world. The more of these well-assorted mental stores are garnered up in the chambers of thought, ready to respond to the call of memory, the greater the amount of material which the mental powers will have to work upon.

48. "Let no one," said he, "compare the mind of the child, thus educated, to a reservoir filled by art. While every system of education should be based upon thorough discipline of the mental *powers*, I would place before them an abundance of the materials of knowledge; and as ideas are recollected perceptions, we may expect, other things being equal, to find the most ideas in those who have had the most thorough education of the senses."

49. Let us profit by such suggestions. Indeed, what extent and variety of knowledge are required in the teacher of children! To be a perfect specimen — a *model* teacher — all science and literature should be at his command: he should be a master of the *art* of instruction, and fascination should dwell upon his lips.

1 ME-CHÂN'-IC-AL, pertaining to machines and the principles of mechanics. *Mechanics* is that science which treats of the doctrines of motion.

2 CÆ'-SAR'S BRIDGE. This refers to the famous bridge which Cæsar built for crossing the Rhine into Germany.

3 CAT-A-PŪL'-TA or CÂT'-A-PULT, BAL-LĪS'-TA, and SCÖR'-PL-O, were warlike engines for throwing stones, darts, and javelins to a distance.

4 AP-PRĒ'-CI-ATE, set a proper value upon.

5 MOD-I-FI-CÂ'-TIONS, changes of form embracing the same principles.

6 IN-FLĒX'-I-BLE, that can not be bent.

7 FĪL'-CRUM, that by which a lever is sustained, or the point about which it moves.

8 FÖRM'-Ū-LA, a general statement of a principle, or general expression for resolving certain cases or problems.

9 MÂN'-Ū-AL, a small hand-book containing a set of rules, principles, or directions.

10 THE-O-RĒT'-IC-AL, pertaining to theory, as opposed to practice.

11 AX'-IS or PIV'-OT, the point of suspension on which the lever turns.

12 AR-CHI-MĒ'-DES, a famous mathematician and mechanician of antiquity, born at Syracuse, in Sicily. Referring to the powers of the lever, he is said to have remarked: "Give me where I may stand, and I will move the world." By the invention of machines he for a long time defended Syracuse on its being besieged by the Romans under Marcellus.

13 TĒN'-SION, the straining, tightness or stretching caused by the weight or power.

14 IN-CLĪNED', tending downward in direction.

15 HŌ-RĒ'-ZON, the level circle which touches the earth at the place of the spectator, and is bounded by the line in which the earth and skies seem to meet.

16 DIS-CRĒD'-IT, show the error of; deprive of credit.

17 PĀR-TERRĒS' (*pār-tārs*), flower-gardens.

18 PER-ŒP'-TION, the notice which the mind takes of external objects.

LESSON VIII.

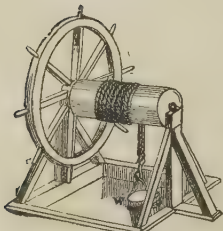
MECHANICAL POWERS—*Continued.*

Fig. 31.

1. *Mr. M.* The *wheel and axle* is, as you see, a *lever* continually acting, and, of course, its powers will be estimated on the same principle as the lever. If the circumference of the wheel is 10 feet, and that of the axle 2 feet, what *power*, applied at the circumference of the wheel, will balance 500 pounds suspended from the axle?

2. *Frank.* The rope attached to the weight will go two feet in one revolution, which will raise the weight two feet; and if we multiply the weight, 500, by its distance, 2 feet, we have 1000. But as the power, multiplied by its distance, 10, must equal this, we have 100 for an answer.



Fig. 32.

Mr. M. That is very handsomely explained. What modifications of the *wheel and axle* can you name?

John. The windlass seems to be, in reality, the same thing.

3. *Frank.* So is the *capstan*, used on large vessels for raising anchors. It is a perpendicular windlass, with holes in its head, in which capstan-bars are put, and many men can work at once.

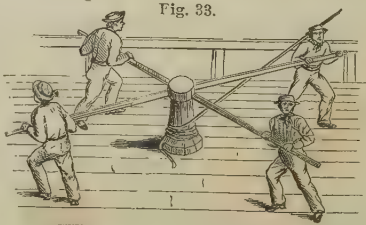


Fig. 33.

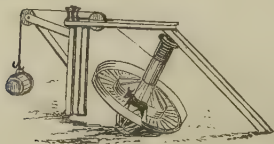


Fig. 34.

George. Is not the tread-mill, sometimes used to raise a heavy mass of iron for the purpose of driving piles, or long logs for wharves, a kind of *wheel and axle*?

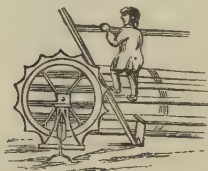


Fig. 35.

4. *Mr. M.* It is a wheel and axle made to revolve by the weight of several persons stepping constantly on the circumference of a long wheel. The tread-wheel is often employed in prisons as a means of driving machinery, where the rogues, as they turn the wheel, can sing,

“They’ve built us up a noble wall,
To keep the vulgar out :
We’ve nothing in the world to do
But just to walk about.”

Next we must talk about the *wedge*, which is reckoned as two inclined planes. Give me some examples of the use of this modified mechanical power.

5. *Ida.* Nails, knives, needles, axes, hatchets, chisels, razors, swords, and scissors.



Fig. 36.

Ella. Then scissors are both levers and inclined planes.

Mr. M. You have named but few of the applications of this power. The wedge is commonly employed in splitting wood, rocks, etc. A thin wedge requires less power to move it forward than a thick one. Can you give me one of the most surprising instances of the power gained by the use of the wedge?

6. *Frank.* I think its use in the supporting and launching of ships is certainly very surprising.

Ella. Oh! I should be so delighted to understand how a ship is launched. I have just read and learned Longfellow’s beautiful description of the “*Building of the Ship.*”

Mr. M. Then you may repeat it if you please.

Ella. I am not certain that I shall get all the words right, but I will try.

7. “Then the master,
With gesture of command
Waved his hand ;
And at the word,
Loud and sudden there was heard,

All around them, and below,
 The sound of hammers, blow on blow,
 Knocking away the shores and spurs.
 And see! she stirs!
 She starts—she moves—she seems to feel
 The thrill of life along her keel,
 And, spurning with her foot the ground,
 With one exulting, joyous bound,
 She leaps into the ocean's arms."

8. *Mr. M.* The very lines seem almost enough to start the vessel from her ways,¹ but the reality is a little more prosaic.²

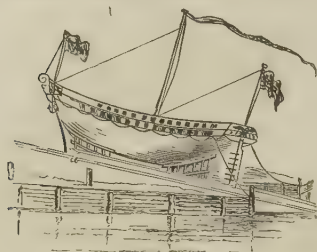


Fig. 37.

The weight of the ship you see in the picture is supported on blocks and wedges under the keel.³ Along the sides are smooth timbers, at an inclination sufficient to enable the vessel to *slide* when the weight comes on to the sliding planks, by means of a frame or cradle fitted to the form of the ship.

9. The ways being well greased, the blocks and wedges which had been supporting the ship are driven out from under the keel, until the whole weight gradually rests upon the sliding ways or cradle, when the noble structure, from its own weight, glides into the water. The *screw* alone remains of the mechanical powers, and this is only a spiral⁴ inclined plane.

10. *John.* Is the screw a *simple machine*?

Mr. M. The screw is placed under the head of simple machines, but can not be used without the application of a lever or some other contrivance, when it becomes a compound engine of great power, either in pressing bodies closer together, or in raising great weights.

George. I do not see how the screw is an *inclined plane*. Will you please explain it?

11. *Mr. M.* That will be evident if you wind the triangular piece of paper, *b, b,* around the pencil or cylinder, *a, a.* Do you not see that the upper edge of the paper continues around the pencil from bottom to top?



Fig. 38.

George. Yes, sir, it is very *plain*.

Ella. The upper edge of the paper, which certainly represents an inclined *plane*, coincides with the screw. And now I see that our winding stairs may be called a large screw.

12. Mr. M. True, common stairs may be considered as an inclined plane, with *notches* to keep the feet from slipping, and the winding of the plane makes a screw. In this case

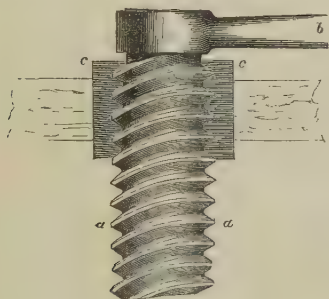


Fig. 39.

people walk on the threads of the screw, but commonly the screw itself is turned. It consists of two parts. In the figure which I here show you, *a*, *a*, is called the *screw*; *c*, *c*, the *nut*; and *b*, the *lever*.

13. John. I see, if the screw is turned far enough one way, it will be raised from the nut a distance equal to that between the *threads*, while if it is turned the other way it will be lowered the same distance. I would like to know how the power gained by its use is calculated.

14. Mr. M. Well, suppose the distance between the threads to be *one inch*, and the length of the lever *five feet*, what pressure can be exerted if a power of *ten pounds* be applied at the end of the handle?

George. Surely this can not be difficult, for the distance in inches which the handle moves, multiplied by the power, ten pounds, must be equal to the *one inch* which the screw moves, multiplied by the number of pounds' pressure.*

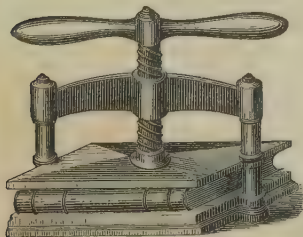


Fig. 40.

15. Mr. M. I am glad you understand the beautiful simplicity of the formula I gave you in the last conversation.

* The distance described by the power must be ten feet in diameter, or 31.416 feet in circumference, which, multiplied by the power 10, will give 314.16. Divide this by one inch, or one twelfth of a foot, and we obtain 3769.92 pounds for the pressure exerted by a power of ten pounds.

John. I have heard of an *endless screw*, but I do not exactly understand its arrangement.

16. *Mr. M.* When the screw is applied to a toothed wheel, it is called a *perpetual* or *endless* screw, as it constantly moves in one direction, and keeps the wheel moving round. I presume, by a little study, you could calculate its power.*

Frank. The screw must be a power of very extensive application. It even propels large vessels round the world.

17. *Ida.* I suppose it was this application of the power that uncle John had in mind when he said *England* and *America* were held together by *screws*.

Mr. M. Politically as well as mechanically, this is a most important and powerful application of the screw. Do you understand the mode of its application to the propulsion^s of ships?

18. *Frank.* I have seen a vessel in a dry dock, and, as the water was withdrawn, had a good opportunity to see how the enormous screw, or rather part of a screw, was fixed. A piece of iron, called a shaft, came through the timbers, and the blades composing the screw were attached to the end of it; and any one could see that by turning, it would push against the water, and by the reaction would propel or push forward the vessel.

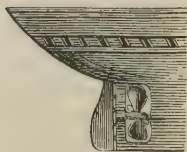
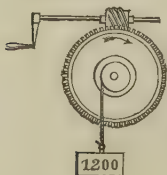


Fig. 41.

19. *Mr. M.* The screw of the steam-ship *Great Britain* was fifteen feet in diameter, and it was turned by a power reckoned equal to a thousand horses. Have you heard of any other remarkable application of this power?

John. I have read of *light-houses* constructed on piles screwed down firmly into the sand.

George. There is also a kind of *pump*, called *Archimedes' Screw*, which I would like very much to understand.



* If the winch, or handle, be 20 inches long, and the screw 2 inches in diameter, there is evidently a power of 20 gained; then, if the wheel have 30 teeth, and the screw at each revolution throws off 1 tooth, this is a power of 3^d gained, which multiplied by 20, the other power, gives a power of 600. Again, say that the cylinder which supports the weight is only half the diameter of the wheel, that is an additional power of 2 to 1, by which multiply the former power, and the result is 1200 as the power gained by this machine.

20. *Mr. M.* This pump will be explained when we come to the subject of Hydraulics.⁶ We have now treated of the three primary and the three modified or compound mechanical powers. I think, from the readiness of your answers, that you understand enough of them to enable you to make any ordinary calculations pertaining to machinery. Our next conversation will be miscellaneous mechanical matters.

¹ *WAYS*, the timbers on which a vessel is launched.

² *PRO-SÁ'-IC*, pertaining to prose, hence less interesting than a poetical description would indicate.

³ *KEEL*, the principal timber in a ship, ex-

tending from stem to stern at the bottom, and supporting the whole frame.

⁴ *SPI'-RAL*, winding like a screw.

⁵ *PRO-PUL'-SION*, the act of driving forward.

⁶ *HY-DRAUL'-ICS*, that branch of Natural Philosophy which treats of fluids considered as in motion. See Fifth Reader.

LESSON IX.

MISCELLANEOUS MECHANICAL MATTERS.

1. *Mr. M.* In our last conversation we discussed the law of equilibrium¹ of the mechanical powers, as it is in *theory*; but when we make a practical application of these powers, a deduction² must be made for friction, or the rubbing of surfaces against each other. Will each of you name some instance of the *utility*³ of friction.

2. *John.* The bands that turn the wheels of mills and factories are kept from slipping by friction.

George. The cars are drawn over the railroad by the friction of the large, or driving wheels of the locomotive, and when they slip round, as they sometimes do in starting, I have seen the engineer throw sand on the rails to increase the friction.

3. *Frank.* When the engineer wishes to stop the cars, he blows the whistle as a signal, and the brakeman turns a wheel, which brings a rubber against the car-wheels, and they are soon stopped by friction.

Ida. If there is any *utility* in dancing, I can give an instance of the *utility* of friction in the chalk which is sometimes put so grotesquely⁴ on the floors of dancing-halls.

4. *Ella.* The friction caused by ashes thrown on icy side-walks is certainly useful.

Mr. M. It would be difficult for you to name any of the ordinary occupations of life without giving an instance of the utility of friction. It holds the nails and screws in our houses, enables us to walk, and even to hold knives, pencils, and books in our hands. It is increased by roughness, and it has been found that there is more friction between pieces of metal of the *same kind*, than between similar pieces of *different metals*.

5. *Frank.* I wonder if that was the reason why Juno's chariot wheels were of *brass*, and the axle of *iron* or *steel*. Homer, who is good authority on such matters, says,

"Hebe to the chariot roll'd
The brazen wheels, and joined them to the smooth
Steel axle."

6. *Mr. M.* If I may add to Master Frank's classical⁵ allusions, I will mention that the gates of the infernal regions, according to Homer were of *iron*, and the threshold of *brass*; though, if I recollect correctly, Virgil says "they are open night and day."

7. *John.* I know that all machinists say that surfaces of brass and steel move upon each other easier than when both are alike.

Frank. That is just what the engineer of a steam-ship said when I was on board, and asked why he was using what he called *anti-attribution*⁶ metal, made from copper, antimony, and tin.

8. *Ida.* I see now why a jeweled watch is better than a common one. The friction is less.

Ella. When we apply oil to our sewing machines, I suppose it must be to diminish friction.

9. *Mr. M.* You have an excellent habit of observation, which saves me much time and trouble in giving illustrations and experiments. Useful as friction is, we sometimes try to avoid it, as in putting wheels under loads to be transported, and casters or rollers on tables and other articles of furniture.

10. *John.* I would like to ask a question. May not the pulley be regarded as a modification of the lever?

Mr. M. The wheel we call the pulley may be so considered, but, taken as a whole, the *cord* and *wheel* may be called the

pulley, though the term *cord* would be more proper. Now, as we are approaching the conclusion of the department of Philosophy called Mechanics, I would suggest that each one of you propose a question involving some of the principles which have formed the topics of our conversations.

11. *Frank*. I am really glad to have such an opportunity to get a solution⁷ of my own difficulties and those of my classmates. I would like to ask if it is possible to construct a machine which, when put in motion, will never stop till it is worn out.

12. *Mr. M*. In other words, a *perpetual motion*. Thousands of dollars have been uselessly spent in vain attempts to accomplish it. I will reply to your very proper question by reading a brief extract from Professor Loomis's Natural Philosophy. He says,

"By perpetual motion in mechanics we understand a *machine which moves without ceasing, and requires no new application of force from without*. A machine which *renews itself* (as, for example, a watch which runs for 24 hours, and then *winds itself up*, so as to be ready to run another 24 hours, without any assistance from beyond itself) would be such a perpetual motion as has been long sought for by visionary inventors. A machine of this kind is *impossible*, because no combination of machinery produces any positive increase of power."

13. A great many machines have been proposed for producing perpetual motion. Here is a drawing of one of them—a large wheel, carrying twelve equal arms, each movable on a hinge, and having at its extremity a heavy ball. But all machines for perpetual motion have failed, unless sustained by expansion and contraction from change of temperature, or electrical⁸ action in some way; and when the motion is thus sustained, it is no more *perpetual motion* than the paper-mill at Niagara Falls.

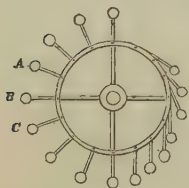


Fig. 42.

14. *Frank*. The reply satisfies me fully, and I shall report it to a good neighbor of ours who is constantly engaged in efforts to produce a *perpetual motion*.

John. I would like to understand what is meant by a *horse-power* and a *unit of work*.

15. *Mr. M.* What is called a *unit of work* is the labor expended in raising *one pound* of matter *one foot* in height, in opposition to gravity. The eminent engineer Watt estimated that a horse could perform 33,000 units of work in a minute; in other words, that a horse could raise 33,000 pounds to the height of one foot in a minute of time, or one pound to the height of 33,000 feet. To see if you understand my reply, I will propose a question. How many horses' power will be required to raise 500 pounds of coal per minute from a pit 330 feet deep?

16. *John.* The amount of work consists of the power multiplied by the distance; therefore 500 pounds raised 330 feet will be 165,000 units of work. A horse can perform 33,000 of these units in a minute; therefore I divide the whole number of units by 33,000, and get for an answer 5 horses' power.

Mr. M. John has answered admirably. What question has George?

George. I wish to know if the *large hind wheels* of a carriage tend to push forward the *small fore wheels*.

17. *Mr. M.* They do not; hence the wheels of railroad cars are made of the same size. In carriages it is convenient to have the fore-wheels smaller, on account of turning the carriage more easily, and often for facility in getting into and out of them. Besides, the line of *traction*,⁹ or draft, should extend to a point lower than the horse's breast, otherwise the collar by which he draws will rise up and choke him, which would be very inconvenient for all concerned.

Ida. My question is one which I never could understand. Why can ships sail in opposite directions when driven by the same wind?

18. *Mr. M.* I will try to make the matter plain to you. On the opposite page is a drawing in which you will see the direction of several ships, and the position in which the wind strikes against the sails. The wind, which is here represented as blowing from the north, strikes directly against the ship at *m*, and she is *scudding*, or *sailing before the wind*, in the same direction the wind blows. In all the other ves-

sels the sails receive the wind obliquely, or not at right angles with the keel.

19. The wind, blowing against the sail of the ship at *f*, the keel being kept in the same direction by the rudder, is resolved into two forces, one of which tends to drive the vessel ahead, and the other to push her sideways. If the vessel were in the form of a tub, she would move

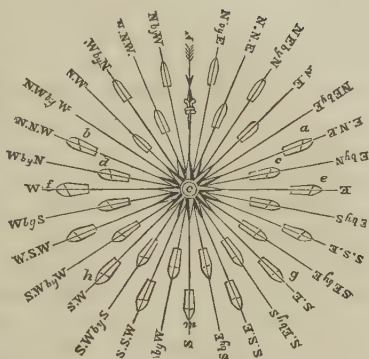


Fig. 43.

toward *h*, or in the diagonal of a square, provided the sail could be kept so as to receive the wind as shown at *f*.

20. Vessels are not round, but long; so it requires much more force to push them sideways than forward. By a proper management of the rudder, not shown in the figure, the ship can be made to sail almost against the wind. When sailing as nearly opposite or against the wind as possible, the ship is said to be *close hauled*, as those marked *a* and *b*.

21. *Ida*. The whole matter seems very plain to me now.

Ella. I fear I shall not so easily understand the answer to my question, as it is perhaps beyond the capacity of a little girl; but no question is too hard to *ask*. Ever since I heard that philosophers had weighed the earth, I have been anxious to know how it was done.

22. *Mr. M*. To understand the method pursued by those who have *weighed the earth* will require a fuller explanation than I have given of the action of gravity. Every particle of matter attracts every other particle, as you have learned; but the attraction is rapidly diminished as the distance increases. *It is inversely*¹⁰ *as the square of the distance*—that is, at *twice* the earth's radius¹¹ from its centre gravity is *one fourth* what it is at the surface. In other words, a pound of matter, as weighed at the surface, would weigh only four ounces 4000 miles above the surface.

23. If a lead ball were to hang from the top of a tower, it

would be attracted a little toward the tower as well as a great deal toward the earth. Now if I can find *how much* the tower attracts the ball, also the *weight* of the tower and the *position* of its *centre of gravity*, as I know the distance of the *earth's centre of gravity*, I can find the weight of the earth.

Do you understand *how*?

Ella. I confess I am as much perplexed as ever.

24. *Mr. M.* I did not expect you to understand with so slight an explanation, and am glad to hear you frankly admit that you do not. That is the way to learn. If there were two globes of equal weight, as two earths, for instance, and a ball were suspended from some distant point so as to be only under the influence of the two spheres,¹² toward which would it hang?

Ella. Toward neither, but half way between them.

25. *Mr. M.* You will soon see, then, how the earth is weighed. Let us suppose the spheres unequal; you must understand that the ball would hang nearer the heavier sphere, but still between them. If you knew the weight of *one* sphere, and the *distance apart* of the *centres* of *both*, and *how much* nearer the ball hung to one than to the other, could you find the *weight* of the *other*?

26. *Ella.* I think I see now how it could be done, and how the earth could be weighed by these principles; for, if we have the weight of one sphere, its distance from the little ball, and the power exerted by it on the ball, we know that the power exerted by the earth must bear a similar proportion to its weight and distance. It does not appear to me half so surprising as it did before that philosophers can weigh the earth; but it seems more and more wonderful that all things are governed by laws so fixed and uniform.

27. *Mr. M.* And the more you study Natural Philosophy, the more plain and simple will its principles seem to you, and the more enlarged will become your views of the works of the Creator. The mind that comprehends the wonderful laws, so sublimely simple and beautiful, that regulate the vast universe of worlds, must ever be deeply impressed with the conviction that there is a great and overruling mind which plan

ned them all, and which still keeps them in harmonious action. It is impossible for a true philosopher to doubt the existence of a God.

28. Here Mr. Maynard informed the class that, as they had now gone over the first great division of subjects embraced in Natural Philosophy, he would bring these conversations to a close; but he hoped to resume them after a few months, when subjects of still greater interest and more variety, in the same important field, would be presented to them.

29. He remarked that they were but just entering upon the study of Nature's laws, and hoped they would not think they had done any thing more than just to make a *beginning*. "The more you learn," said he, "the more you will find there is to be learned; and if you are at all disposed to vanity, the less vain will you be of your own attainments. Much knowledge will always cause, in a sensible person, a feeling of humility, in view of how little he can hope to know in this world, even after a long life spent in study, compared with what will still be unknown.

30. "This principle is well illustrated," said Mr. Maynard, "in the words spoken by that eminent philosopher and true Christian, Sir Isaac Newton, a short time before his death. 'I do not know,' said he, 'what I may appear to the world; but to myself I seem to have been only like a child playing on the sea-shore, and diverting myself in now and then finding a prettier pebble or shell than ordinary, while the great ocean of truth lay all unexplored before me.' If the great Newton, with his powerful intellect, and after devoting a lifetime to the study of Nature's laws (which are none other than the laws of God), could utter such a sentiment, how much more becoming are modesty and humility in us."

1 E-QUI-LĪB'-RI-UM, a state of rest produced by the mutual counteraction of two or more forces.

2 DE-DŪC'-TION, allowance; abatement.

3 U-TĪL'-I-TY, usefulness.

4 GRO-TÉSQUE'-LY, in a fantastic manner.

5 CLAS'-SIC-AL, relating to Greek and Roman authors of the first rank or estimation.

6 AT-TRI'-TION means the act of wearing by friction; and *anti-attrition* means *not wearing by friction*.

7 SO-LŪ'-TION, explanation.

8 E-LĒC'-TRIC-AL, pertaining to electricity.

9 TRĀC'-TION, the act of drawing, or state of being drawn.

10 IN-VĒRS'-LY, in an inverted order.

11 A term used when one quantity is greater as another is less, or less as another is greater.

12 RĀ'-DI-US, a line extending from the centre of a circle to its circumference. The earth's radius is half the earth's diameter.

13 SPHĒRE, a solid body in the form of a round ball.

PART VI.

SKETCHES FROM SACRED HISTORY.

[Continued from the Third Reader.]



"Give me understanding, and I shall keep thy law; yea, I shall observe it with my whole heart."—*Psalms* cxix., 34.

"Blessed is he that readeth, and they that hear the words of this prophecy, and keep those things which are written therein."—*Rev.*, i., 3.

LESSON I.

THE CURSE OF CAIN.

1. It was after our first parents had been driven forth from the garden of Eden, and while they were still living, that the first great crime that stains the annals¹ of our race was committed. Cain and Abel were the two sons of Adam and Eve; and Cain was a tiller of the ground, but Abel was a keeper of sheep.

2. In temper and disposition the two brothers were as different as their occupations; for while Abel was meek, humble, and pious, Cain was haughty, envious, and revengeful. When they brought their customary sacrifices before the Lord, the Lord had respect to Abel and to his offering; but unto Cain and his offering the Lord had not respect.

3. Then was Cain angry; and he talked with Abel his brother; and it came to pass, when they were in the field, that Cain rose up against Abel, and slew him. And the Lord said unto Cain, Where is Abel thy brother? And he said, I know not: Am I my brother's keeper?

4. And the Lord said', What hast thou done? The voice of thy brother's blood crieth unto me from the ground. And now art thou cursed from the earth, which hath opened her mouth to receive thy brother's blood from thy hand. When thou tillest the ground, it shall not henceforth yield unto thee her strength. A fugitive and a vagabond shalt thou be in the earth.

5. Thus was Cain cursed, and driven away from his friends and kindred. And he "went out from the presence of the Lord, and dwelt in the land of Nod, on the east of Eden."

The CURSE OF CAIN has been thus described:

6. O, the wrath of the Lord is a terrible thing!—
Like the tempest that withers the blossoms of spring,
Like the thunder that bursts on the summer's domain,
It fell on the head of the homicide² Cain.

7. And, lo! like a deer in the fright of the chase,
With a fire in his heart, and a brand³ on his face,

He speeds him afar to the desert of Nod,
A vagabond, smote by the vengeance of God !

8. All nature, to him, has been blasted and banned,⁴
And the blood of a brother yet reeks on his hand ;
And no vintage has grown, and no fountain has sprung,
For cheering his heart, or for cooling his tongue.
9. The groans of a father his slumber shall start,
And the tears of a mother shall pierce to his heart,
And the kiss of his children shall scorch him like flame,
When he thinks of the curse that hangs over his name.
10. And the wife of his bosom—the faithful and fair—
Can mix no sweet drop in his cup of despair ;
For her tender caress, and her innocent breath,
But stir in his soul the hot embers of death.
11. And his offering may blaze unregarded by Heaven ;
And his spirit may pray, yet remain unforgiven ;
And his grave may be closed, yet no rest to him bring ;—
O, the wrath of the Lord is a terrible thing ! KNOX.

¹ KAN'-NALS, records of events.

² HÖM'-I-ÖIDE, a person who kills another.

³ BEÄND, a mark burnt in.

⁴ BAN'NED, cursed.

LESSON II.

HAGAR IN THE WILDERNESS.

1. It was several hundred years after the time of Cain that the wicked were destroyed by a flood, an account of which is given in the seventh chapter of Genesis. Then follows the history of Noah and his sons, the building of the tower of Babel, the calling of Abraham, and the destruction of Sodom and Gomorrah.

2. Although Isaac, the younger son of Abraham, was the child of promise, in whom "the nations of the earth were to be blessed," yet Abraham had an elder son Ishmael, who was born of Hagar the Egyptian, the bond-maid of his wife Sarah. But Ishmael was jealous of Isaac, who had destroyed his hopes of inheriting his father's rank and property ; and when Sarah saw Ishmael mocking her son Isaac, she said to Abraham, "Cast out this bond-woman and her son."

3. Then Abraham, being directed by the Lord, rose up early in the morning, and took bread, and a bottle of water,

and gave it unto Hagar and the child, and sent them away. We can well imagine the feelings of sadness with which the aged patriarch parted with these members of his household, and how he turned him to his tent in sorrow as the dejected Hagar took her departure. How beautifully do the following lines describe this parting scene:



“Why bends the patriarch as he cometh now
Upon his staff so wearily? His beard
Is low upon his breast; and his high brow,
So written with the converse¹ of his God,
Beareth the swollen vein of agony.
His lip is quivering, and his wonted² step
Of vigor is not there; and though the morn
Is passing fair and beautiful, he breathes
Its freshness as it were a pestilence.
He gave to her the water and the bread,
But spoke no word, and trusted not himself
To look upon her face, but laid his hand
In silent blessing on the fair-hair'd boy,
And left her to her lot of loneliness.”

4. And Hagar departed, and wandered in the wilderness of Beer-sheba. And when the water was spent in the bottle,

and Ishmael was sore athirst, and his blue eyes were dim and bloodshot, she bore him in her arms, and laid his head

“Beneath the shadow of a desert shrub;
And, shrouding³ up her face, she went away,
And sat to watch, where he could see her not,
Till he should die; and, watching him, she mourn'd:



5. “God stay thee in thine agony, my boy!
I can not see thee die¹; I can not brook⁴
Upon thy brow to look,
And see death settle on my cradle joy¹.
How have I drunk the light of thy blue eye¹!
And could I see thee die¹?
6. “I did not dream of this when thou wast straying,
Like an unbound gazelle, among the flowers;
Or whiling⁵ the soft hours,
By the rich gush of water-sources playing,
Then sinking weary to thy smiling sleep,
So beautiful and deep.
7. “Oh no¹! and when I watch’d by thee the while,
And saw thy bright lip curling in thy dream,
And thought of the dark stream
In my own land of Egypt, the far Nile¹,
How pray’d I that my father’s land might be
A heritage⁶ for thee¹!
8. “And now the grave for its cold breast hath won thee¹!
And thy white, delicate limbs the earth will press¹;
And oh! my last caress
Must feel thee cold¹, for a chill hand is on thee¹.
How can I leave my boy, so pillow’d⁷ there
Upon his clustering hair¹!”

While its bless'd beams a sun-like heat supply,
 Warm every cheek, and dance in every eye—
 To them alone: for Misraim's⁴ wizard train
 Invoke, for light, their monster-gods in vain:
 Clouds heaped on clouds their struggling sight confine,
 And ten-fold darkness broods above their line.

8. " Yet on they press, by reckless vengeance led,
 And range, unconscious, through the ocean's bed;
 Till midway now—that strange and fiery Form
 Showed his dread visage lightening through the storm;
 With withering splendor blasted all their might,
 And brake their chariot-wheels, and marred⁵ their coursers' flight.
 'Fly, Misraim, fly!' The ravenous floods they see,
 And, fiercer than the floods, the DEITY.
 'Fly, Misraim, fly!' From Edom's coral strand
 Again the prophet stretched his dreadful wand:
 With one wild crash the thundering waters sweep,
 And all^{is} waves—a dark and lonely deep:
 Yet o'er those lonely waves such murmurs passed,
 As mortal wailing swelled the nightly blast;
 And strange and sad the whispering breezes bore
 The groans of Egypt to Arabia's shore."

HEBER.

¹ PRIS'-TINE, early; original.

² CHÁ'-os, that confusion in which matter is supposed to have existed before it was reduced to order by the creating power of God.

³ BEE'TLING, overhanging; jutting over.

⁴ MIS'-RA-IM, the name given by the Hebrews to ancient Egypt.

⁵ MÄR'RED, impeded; impaired.

LESSON IV.

ISRAEL UNDER THE JUDGES.

1. DURING forty years after the passage of the Red Sea the children of Israel wandered in the wilderness. Then they crossed the river Jordan, and in seven years, under the leadership of Joshua, completed the conquest of the greater part of the land of Canaan.

2. From the time of the death of Joshua to the election of Saul as king, the Israelites were ruled by judges; but often during this period they relapsed¹ into idolatry, for which they were punished by being delivered into the hands of the surrounding nations. But from time to time the Lord raised up good and valiant men—Othniel, and Ehud, and Barak, and

the prophet Gideon, and Jephthah—who successively delivered them from the power of their enemies.

3. The history of Jephthah derives much interest from a sad event which changed into mourning the public rejoicings for a great victory which he had gained over the enemies of his people. Before engaging in battle he made a vow to the Lord, and said, "If thou shalt without fail deliver the children of Ammon into my hands, then it shall be that whatsoever cometh forth of the doors of my house to meet me, shall surely be the Lord's, and I will offer it up for a burnt-offering." He was triumphant; but on his return to his home at Mizpeh, who should come forth to meet him but his only child—his daughter! This sorrowful event has been well described in the following language:

JEPHTHAH'S DAUGHTER.

4. "The mighty Jephthah led his warriors on
Through Mizpeh's streets. His helm was proudly set',
And his stern lip curl'd slightly', as if praise
Were for the hero's scorn. His step was firm,
But free as India's leopard; and his mail,
Whose shekels² none in Israel might bear',
Was like a cedar's tassel³ on his frame.
His crest was Judah's kingliest'; and the look
Of his dark lofty eye, and bended brow',
Might quell the lion.
5. "A moment more',
And he had reach'd his home'; when lo! there sprang
One with a bounding footstep, and a brow
Of light, to meet him. Oh! how beautiful'!—
Her dark eye flashing like a sunlit gem—
And her luxuriant hair'!—'twas like the sweep
Of a swift wing in visions. He stood still,
As if the sight had wither'd him'. She threw
Her arms about his neck—he heeded not.
She called him "Father"—but he answered not.
She stood and gazed upon him. Was he wroth?⁴
There was no anger in that bloodshot eye.
Had sickness seized him'? She unclasp'd his helm,
And laid her white hand gently on his brow,
And the large veins felt stiff and hard, like cords.
The touch aroused him'. He raised up his hands,
And spoke the name of God, in agony.



6. “ She knew that he was stricken, then’; and rush’d
Again into his arms’; and, with a flood
Of tears she could not stay’, she sobb’d a prayer
That he would breathe his agony in words.
He told her’, and a momentary flush
Shot o’er her countenance; and then the soul
Of Jephthah’s daughter waken’d’; and she stood
Calmly and nobly up, and said, ’twas well—
And she would die,

7. “ The sun had well-nigh set.
The fire was on the altar; and the priest
Of the high God was there. A pallid man
Was stretching out his trembling hands to heaven,
As if he would have prayed, but had no words—
And she who was to die, the calmest one

In Israel at that hour, stood up alone,
 And waited for the sun to set. Her face
 Was pale, but very beautiful—her lip
 Had a more delicate outline, and the tint
 Was deeper; but her countenance was like
 The majesty of angels.

The sun set—

And she was dead—but not by violence.”—N. P. WILLIS.

8. Although the Bible tells us that Jephthah did with his daughter “according to his vow which he had vowed,” yet some commentators,⁵ making the closing paragraph of his vow read, “*o* I will offer it up for a burnt-offering,” suppose that he did not slay his daughter, but dedicated her to the Lord, and set her apart for the service of the tabernacle. The poet has made the supposition that before the appointed time of sacrifice she died, “but not by violence.”

¹ RE-LAPS'ED, fell back.

² SHEK'-EL, here used for weight.

³ TAS'-SEL, cluster of the *tassel*-like leaves of some species of pine.

⁴ WROTH (*rawth*), very angry.

⁵ COM'-MENT-À-TORS, those who write comments or explanations.

LESSON V.

RUTH AND NAOMI.

1. It was during a severe famine, while the Judges ruled Israel, that Elimelech, of the tribe of Judah, with his wife Naomi and his two sons, removed into the land of Moab, where the young men married. Death soon deprived Naomi of her husband and her sons: she then resolved to return to her native country, and her daughters-in-law generously offered to accompany her.

2. On representing the difficulties they would have to encounter, one of them was disheartened, and turned back; but the other, named Ruth, persevered. And Ruth said, “Entreat me not to leave thee, or to return from following after thee; for whither thou goest I will go, and where thou lodgest I will lodge: thy people shall be my people, and thy God my God. Where thou diest will I die, and there will I be buried: the Lord do so to me, and more also, if aught but death part thee and me.”

3. When Naomi saw that she was steadfastly minded to go with her, she left speaking to her. So Naomi returned, taking her daughter-in-law with her; and they came to Bethlehem in the beginning of barley-harvest. The story of Ruth pleading with Naomi has been very beautifully told in the following lines:

4. " 'Entreat me not to leave thee, but convert me to the truth;'
 So spake in sorrow and in tears the gently-chiding Ruth.
 'Entreat me not to leave thee, nor unclasp thy loosening hand;
 I'll follow thee, my mother, to the far Judean land.'
 But, turning still in grief away from her young, pleading face,
 And sadly putting back the arms so fondly that embrace—
 'My daughter,' thus Naomi said, in measured tones and deep,
 'We have our Sabbaths in that land, and holy days to keep,
 And there's a bound we can not pass upon that day, you know;'
 But Ruth said, 'Only where thou goest, mother, will I go.'
5. "Still spake Naomi, 'Turn again—thy home is not with me;
 For Judah's children must not with the outeast Gentile be.'
 Ruth answered, 'In that stranger-land with thee, oh, let me stay,
 And where thou lodgest I will lodge—I can not go away.'
 And then again Naomi, 'We have precepts to observe,
 And from our fathers' worship are commanded not to swerve.'
 Ruth answered with religious zeal, 'I bow to Judah's Lord:
 Thy people shall my people be—thy God shall be my God.'
6. "And now the mother's love burst forth, and rose in accents wild;
 'Turn back, beloved, oh! turn back, for think you, Ruth, my child,
 Your fainting heart could ever bear the woes I number now?
 They must not dim those gentle eyes, nor darken o'er that brow;
 For though thy mother yields to them, yet, dearest daughter mine,
 It were not meet that they should fall on such a head as thine.'
7. "Then Ruth, with sudden brightness in her mild and loving eye,
 'However hard thy death may be, thus only will I die.'
 But yet once more Naomi spoke, 'My daughter, for the dead
 We have a house of burial;' but Ruth, still answering, said,
 'And there will I be buried; and the Lord deal thus by me,
 If aught, my mother, on the earth, but death, part thee and me.'"

MRS. E. H. J. CLEAVELAND.

8. On their arrival in Canaan Naomi found herself forgotten by her kinsfolk, and was obliged to depend for support on the labor of her affectionate daughter-in-law. While Ruth was gleaning in the lands of a wealthy man of that country, named Boaz, her beauty and modesty arrested his attention;

he spoke to her kindly, and ordered his reapers to drop some of the barley in her way, so as to afford her relief in the most delicate manner.

9. Not long after this the virtuous Ruth became the wife of the wealthy Boaz; and from this union sprang Obed, the father of Jesse, who was the father of David, the royal progenitor of the Messiah. The story of Ruth conveys one of the most beautiful pictures ever drawn of fidelity and affection, while its allusions to the customs of the people of Israel present a lively view of pastoral and rural life as exhibited at that early period of history.

LESSON VI.

THE REIGN OF DAVID.

1. THE reign of David, like that of Saul, was filled with wars carried on against the surrounding heathen nations. In one of his wars David gained possession of Jebus, or Jerusalem, the strong-hold of the Jebusites; and so pleased was he with the strength and beauty of the place, that he made it the capital of his kingdom.

2. The latter part of the reign of David was clouded by domestic calamities. The child of his wife Bathsheba died; Amnon, the eldest of the royal princes, was slain by his brother Absalom; and the ambitious Absalom himself plotted against his father, and soon became the head of a formidable conspiracy. The surpassing beauty of Absalom seemed to win the hearts of the people; and it is said of him that "in all Israel there was none to be so much praised as Absalom for his beauty; from the sole of his foot even unto the crown of his head there was no blemish in him."

3. No sooner was the standard of revolt raised by his misguided and unnatural son, than King David, with a few faithful followers, was compelled to flee from Jerusalem. He "went up by the ascent of Mount Olivet, and wept as he went up, and had his head covered, and he went barefoot; and all the people that were with him covered every man his head, and they went up, weeping as they went."

4. Notwithstanding the prospects of success which at first encouraged Absalom, a numerous army soon assembled around King David, and the contest was to be decided by a battle. The field of struggle was the wood of Ephraim, in the great plain of Jordan. The fond father gave the strongest injunctions to his soldiers to spare his beloved son; but as Absalom fled from the field, his long and beautiful hair became entangled in an oak, and in this condition Joab, the king's captain, slew him.

5. When word was brought to David at Jerusalem that Absalom was slain, the aged king lamented the loss of his disobedient child with the most passionate sorrow; and we are told that "he went up to the chamber over the gate, and wept: and as he went, thus he said: 'O my son Absalom! my son, my son Absalom! would God I had died for thee, O Absalom! my son, my son.'" The scene in which David is supposed to have taken his last look of his erring but loved son, lying cold in death, and the lamentation which he there uttered, have been thus described:

DAVID'S LAMENT FOR ABSALOM.

6. The pall¹ was settled. He who slept beneath
Was straighten'd for the grave; and, as the folds
Sunk to the still proportions, they betray'd
The matchless symmetry² of Absalom.
His hair was yet unshorn, and silken curls
Were floating round the tassels as they sway'd
To the admitted air, as glossy now
As when, in hours of gentle dalliance,³ bathing
The snowy fingers of Judæa's daughters.
7. His helm was at his feet; his banner, soil'd
With trailing through Jerusalem, was laid,
Reversed, beside him; and the jewel'd hilt,
Whose diamonds lit the passage of his blade,
Rested, like mockery, on his cover'd brow.
The soldiers of the king trod to and fro,
Clad in the garb of battle; and their chief,
The mighty Joab, stood beside the bier,
And gazed upon the dark pall steadfastly,
As if he fear'd the slumberer might stir.
8. A slow step startled him. He grasp'd his blade
As if a trumpet rang; but the bent form

Of David enter'd, and he gave command,
In a low tone, to his followers,
And left him with his dead. The king stood still
Till the last echo died; then, throwing off
The sackcloth⁴ from his brow, and laying back
The pall from the still features of his child,
He bowed his head upon him, and broke forth
In the resistless eloquence of woe.



9. "Alas! my noble boy! that thou shouldst die!
Thou, who wert made so beautifully fair!
That death should settle in thy glorious eye,
And leave his stillness in this clustering hair!
How could he mark thee for the silent tomb!
My proud boy, Absalom!
10. "Cold is thy brow, my son! and I am chill,
As to my bosom I have tried to press thee!
How was I wont to feel my pulses thrill,
Like a rich harp-string, yearning to caress thee,

And hear thy sweet '*my father!*' from those dumb
And cold lips, Absalom!

11. "But death is on thee. I shall hear the gush
Of music, and the voices of the young;
And life will pass me in the mantling⁵ blush,
And the dark tresses to the soft winds flung;
But thou no more, with thy sweet voice, shalt come
To meet me, Absalom!

12. "And oh! when I am stricken,⁶ and my heart,
Like a bruised reed, is waiting to be broken.
How will its love for thee, as I depart,
Yearn for thine ear to drink its last deep token!
It were so sweet, amid death's gathering gloom,
To see thee, Absalom!

13. "And now, farewell! 'Tis hard to give thee up.
With death so like a gentle slumber on thee;—
And thy dark sin!—oh! I could drink the cup,
If from this woe its bitterness had won thee.
May God have called thee, like a wanderer, home,
My lost boy, Absalom!"

14. He covered up his face, and bowed himself
A moment on his child; then, giving him
A look of melting tenderness, he clasped
His hands convulsively, as if in prayer.
And, as if strength were given him of God,
He rose up calmly, and composed the pall
Firmly and decently—and left him there,
As if his rest had been a breathing sleep.

N. P. WILLIS.

¹ PALL, the cloth thrown over a dead body at funerals. ⁴ SACK'-CLOTH, a coarse cloth used in mourning.
² SYM'-ME-TRY, beauty of form; a due proportion of the several parts to each other. ⁵ MAN'-TLING, rising; spreading as a blush spreads over the face.
³ DAL'-LI-ANCE, acts of fondness. ⁶ STRICK'-EN, cast down; far gone with age.

LESSON VII.

THE KINGDOM OF ISRAEL.

1. THE prosperity of the Hebrews as a nation ended with the death of Solomon, the son and successor of King David. When Rehoboam, the son of Solomon, came to the throne, the ten northern tribes revolted, choosing Jeroboam as their king; and from this time Israel and Judah, with which latter

was united part of the tribe of Benjamin, were separate kingdoms. The separation thus effected is called "The Revolt of the Ten Tribes."

2. The subsequent princes of the kingdom of Israel, as the ten tribes were called, were all idolaters in the sight of the Lord, although from time to time they were warned of the consequences of their idolatry by the prophets Elijah, Elisha, Hosea, Amos, Jonah, and others.

3. The history of Elijah is one of exceeding interest. Fleeing before the wicked Ahab, he was miraculously fed by ravens in his concealment; he restored to life the son of the widow who generously gave him a share of her little store; he caused the false prophets of Baal to be put to death; and when he fled from the wicked Jezebel into the wilderness, he witnessed there some wonderful manifestations of Divine power; and, finally, he was taken up alive into heaven.

4. The scene in the wilderness, when he was commanded to go forth and stand upon Mount Horeb before the Lord, is thus described in the Bible. "And behold, the Lord passed by, and a great and strong wind rent the mountains, and brake in pieces the rocks before the Lord; but the Lord was not in the wind: and after the wind an earthquake; but the Lord was not in the earthquake: and after the earthquake a fire; but the Lord was not in the fire: and after the fire a still small voice."

The poet Campbell has made the following beautiful phrase¹ of this passage:

ELIJAH'S INTERVIEW WITH GOD.

5. "On Horeb's rock the prophet stood—
The Lord before him passed;
A hurricane in angry mood
Swept by him strong and fast;
The forest fell before its force,
The rocks were shiver'd in its course—
God was not in the blast:
Announcing danger, wreck, and death,
'Twas but the whirlwind of his breath.
6. "It ceased. The air grew mute—a cloud
Came, muffling up the sun;

When, through the mountain, deep and loud
 An earthquake thundered on ;
 The frightened eagle sprang in air,
 The wolf ran howling from his lair²—
 God was not in the storm :
 'Twas but the rolling of his car,
 The trampling of his steeds from far.

7. " 'Twas still again, and nature stood
 And calmed her ruffled³ frame ;
 When swift from heaven a fiery flood
 To earth devouring came ;
 Down to the depth the ocean fled ;
 The sickening sun looked wan⁴ and dead—
 Yet God filled not the flame :
 'Twas but the terror of his eye
 That lightened through the troubled sky.

8. " At last a voice all still and small
 Rose sweetly on the ear,
 Yet rose so shrill and clear, that all
 In heaven and earth might hear :
 It spoke of peace, it spoke of love,
 It spoke as angels speak above—
 And God himself was there ;
 For oh ! it was a Father's voice,
 That bade the trembling world rejoice.

CAMPBELL.

¹ PAR'-A-PHRASE, an explanation of some text or passage in a more clear and ample manner than is expressed in the words of the author. ² LAIR, the bed or couch of a wild beast. ³ RUF'FLED, disturbed ; agitated. ⁴ WAN, pale ; of a sickly color.

LESSON VIII.

THE KINGDOM OF JUDAH.

1. THE history of Judah, after the revolt of the Ten Tribes, is but little more than the history of a single town, Jerusalem ; although Bethlehem and Hebron, villages then of little importance, were included in the Judean territory. Some of the kings of Judah, like those of Israel, fell into idolatry, for which they and their people were punished by being delivered into the hands of the surrounding nations : others restored the worship of the true God ; and of them it is recorded that " God prospered their undertakings."

2. During the reign of the wicked and idolatrous Ahaz, the

country was brought to the brink of ruin. The prophet Isaiah, who lived at that time, points out the corruptions of the land in strong terms. He calls the nation "a sinful people laden with iniquity, a seed of evil-doers." He also says, "Thy princes are rebellious, and companions of thieves." The misery that overspread the land is vividly depicted: "Your country is desolate, your cities are burned with fire; your land, strangers devour it in your presence." Once the Egyptians had plundered Jerusalem; and Ahaz paid tribute to Assyria.

3. Hezekiah was as zealous in the cause of God as his father had been indifferent; he cleansed and sanctified the Temple, and restored its services; and he refused to pay tribute to Assyria. Then Sennacherib,² the king of Assyria, determining to be revenged upon Judah, sent a large army against Jerusalem; but we are told that "the angel of the Lord went forth, and smote, in the camp of the Assyrians, a hundred and fourscore and five thousand men."

4. Accounts of this miraculous overthrow of the Assyrian army are found in Persian and Egyptian history, as well as in the Bible. The instrument by which the Lord executed vengeance upon the Assyrians is supposed by some to have been the *simoom*³ of the desert; for Isaiah had prophesied of the King of Assyria, "Thus saith the Lord, behold, I will send a *blast* upon him." Byron's description of the overthrow of the Assyrian host is too beautiful to be omitted.

DESTRUCTION OF SENNACHERIB—711 B.C.

5. The Assyrian came down like the wolf on the fold,
And his cohorts⁴ were gleaming in purple and gold;
And the sheen⁵ of their spears was like stars on the sea,
When the blue wave rolls nightly on deep Galilee.
6. Like the leaves of the forest when summer is green,
That host with their banners at sunset were seen;
Like the leaves of the forest when autumn hath blown,
That host on the morrow lay withered and strown.
7. For the angel of death spread his wings on the blast,
And breathed in the face of the foe as he passed;
And the eyes of the sleeper waxed⁶ deadly and chill,
And their hearts but once heaved, and forever were still!

8. And there lay the steed with his nostrils all wide,
But through them there rolled not the breath of his pride,
And the foam of his gasping lay white on the turf,
And cold as the spray on the rock-beating surf.
9. And there lay the rider, distorted and pale,
With the dew on his brow and the rust on his mail;⁷
And the tents were all silent, the banners alone,
The lances unlifted, the trumpet unblown.
10. And the widows of Ashur are loud in their wail,
And the idols are broke in the temple of Baal;
And the might of the Gentile, unsmote by the sword,
Hath melted like snow in the glance of the Lord. BYRON.

¹ DE-PICT'-ED, described; represented in words. casionally in Arabia and Syria, and the neighboring countries.

² SEN-NACH'-E-RIB (*sen-nak'-e-rib*). Also ⁴ ÖÖ'-HORT, a band or body of warriors.

⁵ SHEEN, brightness; splendor.

³ SI-MOOM', a hot, dry wind, that blows ec- ⁶ WAXED, became.

⁷ MAIL, armor; coat of steel net-work.

LESSON IX.

ADVENT OF THE MESSIAH.

1. PASSING over a period of nearly seven hundred years from the time of the Prophet Isaiah, the inspired writer who most clearly foretells the advent¹ of Christ, we come down to that remarkable period in Roman history when Augustus Cæsar ruled over all the then civilized world, and the heathen temple of Janus, always open in time of war, was closed for the third time since the foundation of Rome. It was at this auspicious² period that Jesus Christ, the promised Messiah, was born at Bethlehem in Judæa, then a Roman province; and thus, literally, was his advent the herald³ of "peace on earth, and good-will toward men."

2. The wonderful event of the nativity⁴ was not proclaimed to the nations like the coming of a temporal prince, but was first announced to a company of shepherds in Judæa as they watched their flocks by night. The manner of the announcement is thus related in the second chapter of Luke:

3. "And there were in the same country shepherds abiding in the field, keeping watch over their flock by night. And, lo, the angel of the Lord came upon them, and the glory of

the Lord shone round about them; and they were sore afraid.

4. "And the angel said unto them, Fear not; for, behold, I bring you good tidings of great joy, which shall be to all people. For unto you is born this day, in the city of David, a Savior, which is Christ the Lord. And this shall be a sign unto you: Ye shall find the babe wrapped in swaddling-clothes,⁵ lying in a manger. And suddenly there was with the angel a multitude of the heavenly host praising God, and saying, Glory be to God in the highest, and on earth peace, good-will toward men."

5. The beautiful hymn beginning,

"While shepherds watched their flocks by night,"

is descriptive of the same event; but as it is doubtless already familiar to our readers, we introduce one not so generally known, but scarcely less beautiful.

THE NATIVITY.

6. "Judæa's plains in silence sleep
 Beneath the cloudless midnight sky,
 And o'er their flocks the shepherds keep
 Kind watch, to David's city nigh:
 That royal city!—nobler Guest
 Is she a while to entertain
 Than proudest monarch, whose behest⁶
 It is o'er earthly realms to reign.
 By Him salvation is to mortals given,
 On earth is shed the peerless⁷ noon of heaven.

7. "For see! along the deep blue arch
 A glory breaks; and now a throng
 From where the sparkling planets march
 Comes trooping⁸ down with shout and song;
 And o'er those pastures, bathed in light,
 The sacred legions stay their wing,
 While on the wakeful ear of night
 Steals the rich hymn that seraphs sing.
 And sweetly thus the mellow accents ran,
 'Glory to God, Good-will and Peace to Man!'" TAPPAN.

¹ AD'-VENT, a coming; the coming of the Savior.

² AU-SPI'-CIOUS, favorable; fortunate.

³ HER'-ALD, proclaimer; announcer.

⁴ NA-TIV'-I-TY, birth.

⁵ SWAD'-DLING-CLÖTHES, bands wrapped around an infant.

⁶ BE-HËST', authorized right; command.

⁷ PEER'-LESS, unequalled.

⁸ TROOP'-ING, moving in a crowd.

LESSON X.

THE MIRACLES OF THE SAVIOR.

1. OF the many miracles wrought by the Savior during his ministry, as he "went about doing good," there are some that especially call forth our feelings of sympathy for the afflicted, while they at the same time direct our thoughts to Christ as the Great Physician, who was sent for the healing of the nations. Some of the finest poems in our language are descriptive of these miracles; and nowhere can be found better reading-lessons for the young than are presented in extracts from them.

2. Of the *Cleansing of the Leper*, we find, in the Evangelist Mark,* the following brief account:

"And there came a leper to him, beseeching him, and kneeling down to him, and saying unto him, If thou wilt, thou canst make me clean. And Jesus, moved with compassion, put forth his hand, and touched him, and saith unto him, I will; be thou clean. And as soon as he had spoken, immediately the leprosy departed from him, and he was cleansed."

3. From Willis's poem, "The Leper," we extract the following:

I. THE LEPER.

It was noon;

And Helon knelt beside a stagnant pool
In the lone wilderness, and bathed his brow,
Hot with the burning leprosy, and touched
The loathsome water to his fevered lips,
Praying that he might be so bless'd—to die!
Footsteps approached, and with no strength to flee,
He drew the covering closer on his lip,
Crying, "Unclean! unclean!" and in the folds
Of the coarse sackcloth shrouding up his face,
He fell upon the earth till they should pass.

4. Nearer the stranger came, and bending o'er
The leper's prostrate form, pronounced his name—
"Helon!" The voice was like the master-tone

* Mark, i., 40-42; also Matt., viii., 2-4; and Luke, v., 12-16.



Of a rich instrument—most strangely sweet ;
 And the dull pulses of disease awoke,
 And for a moment beat beneath the hot
 And leprous scales with a restoring thrill.
 “Helon’ ! arise’ !” and he forgot his curse,
 And rose and stood before Him.

5.

Love and awe

Mingled in the regard of Helon’s eye
 As he beheld the stranger. He was not
 In costly raiment clad, nor on His brow
 The symbol of a princely lineage wore ;
 No followers at His back, nor in His hand
 Buckler, or sword, or spear ; yet in His mien
 Command sat throned serene, and if He smiled,
 A kingly condescension graced His lips,
 The lion would have crouch’d to in his lair.

6.

His garb was simple, and His sandals worn ;
 His stature model’d with a perfect grace ;
 His countenance the impress of a God,
 Touch’d with the opening innocence of a child ;
 His eye was blue and calm, as is the sky
 In the serenest noon ; His hair unshorn
 Fell to His shoulders ; and His curling beard
 The fullness of perfected manhood bore.

7.

He looked on Helon earnestly a while,
 As if his heart were moved, and, stooping down,

He took a little water in His hand
 And laid it on his brow, and said, "Be clean'."
 And lo ! the scales fell from him, and his blood
 Coursed with delicious coolness through his veins,
 And his dry palms grew moist, and on his brow
 The dewy softness of an infant stole.
 His leprosy was cleansed ; and he fell down
 Prostrate at Jesus' feet, and worship'd Him.

WILLIS.

8. The following is too beautiful to be omitted :

Alone on Jordan's plain,
 His head all bare to sun and rain,
 A leper roamed with garments rent,
 And wailing voice, still crying as he went,
 Unclean ! Unclean ! Unclean !

9. But Jesus passed by ;
 And as his blessed feet drew nigh
 He listened, while the suppliant prayed ;
 And kindly to that dying soul he said,
 Be clean ! Be clean ! Be clean !

10. By sin thus tainted sore,
 I roam earth's barren desert o'er ;
 My head is bare to storms of woe,
 My dreary voice still crying as I go,
 Unclean ! Unclean ! Unclean !

11. Oh, Thou ! who on the Tree
 Of Agony once died for me,
 With pitying mercy hear my cry,
 And kindly to my guilty soul reply,
 Be clean ! Be clean ! Be clean !

Anonymous.

II. THE WIDOW OF NAIN.

1. And it came to pass the day after, that he went into a city called Nain ; and many of his disciples went with him, and much people. Now when he came nigh to the gate of the city, behold, there was a dead man carried out, the only son of his mother, and she was a widow ; and much people of the city was with her.

2. And when the Lord saw her, he had compassion on her, and said unto her, Weep not. And he came and touched the bier, and they that bare him stood still. And he said,

Young man', I say unto thee', Arise'. And he that was dead sat up, and began to speak: and he delivered him to his mother. (Luke vii., 11-15.)



3. The Roman sentinel stood helm'd and tall
Beside the gate of Nain. The busy tread
Of comers to the city mart¹ was done,
For it was almost noon, and a dead heat
Quiver'd upon the fine and sleeping dust,
And the cold snake crept panting from the wall,
And bask'd his scaly circles in the sun.
Upon his spear the soldier lean'd, and kept
His idle watch; and, as his drowsy dream
Was broken by the solitary foot
Of some poor mendicant,² he raised his head
To curse him for a tributary³ Jew,
And slumberously dozed on.

1.

'Twas now high noon.
The dull, low murmur of a funeral

Went through the city—the sad sound of feet
Unmix'd with voices—and the sentinel
Shook off his slumber, and gazed earnestly
Up the wide streets along whose paved way
The silent throng crept slowly. They came on,
Bearing a body heavily on its bier.

There was one—

Only one mourner. Close behind the bier,
Crumpling the pall up in her wither'd hands,
Follow'd an aged woman. Her short steps
Falter'd with weakness, and a broken moan
Fell from her lips, thicken'd convulsively
As her heart bled afresh. The pitying crowd
Follow'd apart, but no one spoke to her.
She had no kinsmen.⁴ She had lived alone—
A widow with one son. He was her all—
The only tie she had in the wide world—
And he was dead. They could not comfort her.

6. Forth from the city gate the pitying crowd
Follow'd the stricken mourner. They came near
The place of burial, and, with straining hands,
Closer upon her breast she clasp'd the pall,
And with a gasping sob, quick as a child's,
And an inquiring wildness flashing through
The thin gray lashes of her fever'd eyes,
She came where Jesus stood beside the way.
He look'd upon her, and his heart was moved.

7. "Weep not!" he said; and as they stay'd the bier,
And at his bidding laid it at his feet,
He gently drew the pall from out her grasp,
And laid it back in silence from the dead.
With troubled wonder the mute throng drew near,
And gazed on his calm looks. A minute's space
He stood and pray'd. Then, taking the cold hand,
He said, "Arise!" And instantly the breast
Heaved in its cerements,⁵ and a sudden flush
Ran through the lines of the divided lips,
And with a murmur of his mother's name,
He trembled and sat upright in his shroud.
And, while the mourner hung upon his neck,
Jesus went calmly on his way to Nain. N. P.

N. P. WILLIS.

¹ MÄRT, a place for the sale of goods.

² MEN'-DI-CANT, a beggar.

⁸ TRIB'-Ū-TA-RY, paying a tribute or tax to secure protection.

[4 KINS'-MEN, relations; kindred.

⁵ CÈRE'-MENTS, cloths dipped in melted wax, with which dead bodies are infolded when embalmed.

III. THE HEALING OF THE DAUGHTER OF JAIRUS.

1. And, behold, there cometh one of the rulers of the synagogue, Jairus by name; and when he saw Jesus he fell at his feet, and besought him greatly, saying, My little daughter lieth at the point of death: I pray thee, come and lay thy hands on her, that she may be healed, and she shall live.

2. And Jesus went with him, and much people followed him, and thronged him. And he cometh to the house of the ruler of the synagogue, and seeth the tumult, and them that wept and wailed greatly. And one said, Thy daughter is dead: why troublest thou the Master any further? But Jesus said, The damsel is not dead, but sleepeth. And they laughed him to scorn.

3. But when he had put them all out, he taketh the father and the mother of the damsel, and them that were with him, and entereth in where the damsel was lying. And he took the damsel by the hand, and said unto her, Maiden, arise. And straightway she arose and walked.—Matt., ix.; Mark, v.; Luke, viii.

4.

“The same silvery light
That shone upon the lone rock by the sea,
Slept on the ruler's lofty capitals,
As at the door he stood, and welcomed in
Jesus and his disciples. All was still.
The echoing vestibule¹ gave back the slide
Of their loose sandals,² and the arrowy beam
Of moonlight, slanting to the marble floor,
Lay like a spell of silence in the rooms
As Jairus³ led them on. With hushing steps
He trod the winding stair; but ere he touch'd
The latchet, from within a whisper came,
'Trouble the Master not—for she is dead!'
And his faint hand fell nerveless⁴ at his side,
And his steps falter'd, and his broken voice
Choked in its utterance; but a gentle hand
Was laid upon his arm, and in his ear
The Savior's voice sunk thrillingly and low,
'She is not dead—but sleepeth.'

5.

“They passed in.
The spice-lamps in the alabaster urns
Burn'd dimly, and the white and fragrant smoke



Curl'd indolently on the chamber walls.
 The silken curtains slumber'd in their folds—
 Not even a tassel stirring in the air ;
 And as the Savior stood beside the bed,
 And pray'd inaudibly,⁵ the ruler heard
 The quickening division of his breath
 As he grew earnest inwardly. There came
 A gradual brightness o'er his calm, sad face ;
 And, drawing nearer to the bed, he moved
 The silken curtains silently apart,
 And look'd upon the maiden.

6.

“ Like a form
 Of matchless sculpture in her sleep she lay—
 The linen vesture⁶ folded on her breast,
 And over it her white transparent hands,
 The blood still rosy in their tapering nails.
 A line of pearl ran through her parted lips,
 And in her nostrils, spiritually thin,
 The breathing curve was mockingly like life ;
 And round beneath the faintly-tinted skin
 Ran the light branches of the azure veins ;
 And on her cheek the jet' lash overlay,
 Matching the arches pencil'd on her brow.
 Her hair had been unbound, and falling loose
 Upon her pillow, hid her small round ears
 In curls of glossy blackness, and about
 Her polish'd neck, scarce touching it, they hung,
 Like airy shadows floating as they slept.

7. 'Twas heavenly beautiful. The Savior raised
 Her hand from off her bosom, and spread out
 The snowy fingers in his palm, and said,
'Maiden! Arise!' and suddenly a flush
 Shot o'er her forehead, and along her lips
 And through her cheek the rallied color ran;
 And the still outline of her graceful form
 Stirr'd in the linen vesture; and she clasp'd
 The Savior's hand, and fixing her dark eyes
 Full on his beaming countenance—*AROSE.*"

N. P. WILLIS.

- ¹ VES'-TI-BULE, the porch or entrance into a house; also an inner court which leads into a suite of rooms. ⁴ NERVE'-LESS, destitute of strength.
² SAN'-DAL, the ancient form of shoe, consisting of a sole fastened to the foot. ⁵ IN-AUD'-I-BLY, in a manner not to be heard.
³ JĀ'-I-RUS, a Roman ruler in Judæa. ⁶ VEST'-URE, garment; covering.
⁷ JET, of the deepest black.

LESSON XI.

THE CRUCIFIXION.

1. AND when they were come to the place which is called Calvary where they crucified him, and the malefactors, one on the right hand and one on the left. Then said Jesus, Father, forgive them, for they know not what they do.

2. "This was the earth's consummate hour;
 For this hath blazed the prophet's power;
 For this hath swept the conqueror's sword;
 Hath ravaged, raised, cast down, restored:
 Persepölis, Rome, Babylon!
 For this ye sank, for this ye shone!

3. "Yet things to which earth's brightest beam
 Were darkness—earth itself a dream;—
 Foreheads on which shall crowns be laid
 Sublime, when sun and star shall fade;—
 Worlds upon worlds, eternal things,
 Hung on thy anguish, King of Kings!

4. "Still from his lip no curse has come;
 His lofty eye has look'd no doom;
 No earthquake burst, no angel brand
 Crushes the black, blaspheming band:
 What say those lips, by anguish riven?
 'God, be my murderers forgiven!'"

CROLY.

THE END.



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